ELECTRICAL REVIEW

FRIDAY
2 SEPTEMBER 1961

WEEKLY
PRICE 1s 6d

Crompton Parkinson NOW INTRODUCE

The C.P. 'T' Range of motors has now been extended to include the T30 Series–available as SHADED-POLE, SPLIT-PHASE & CAPACITOR motors of lower H.P. ratings.

A good name for FHP motors

CROMPTON PARKINSON LTD · CROMPTON HOUSE · ALDWYCH · LONDON · WC2

STANTON AND STAVELEY

PRESTRESSED

Spun Concrete Lighting Columns

Type 8K Prestressed Spun Concrete Lighting Columns at Bowater Paper Mills, Northfleet, Kent.

This illustrates one of our many designs approved by the Council of Industrial Design and acceptable to the Ministry of Transport for use on trunk roads.

Photograph by courtesy of
The Bowater Paper Corporation Limited

MAIN PRODUCTS

PIG IRON
FOUNDRY,
BASIC, REFINED

CAST IRON
PIPES AND FITTINGS
GENERAL CASTINGS
TUNNEL SEGMENTS
INGOT MOULDS

CONCRETE
PIPES, MANHOLES AND GULLIES
PAVING FLAGS
GENERAL PURPOSE SHEDS

PRESTRESSED CONCRETE
PRESSURE PIPES
LIGHTING COLUMNS

COKE OVEN BY-PRODUCTS
GAS, COKE, TAR

CHEMICALS

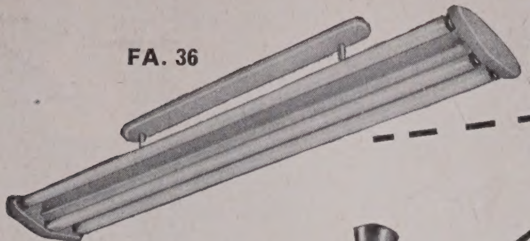
BLAST FURNACE SLAG
TREATED, DRY
HOT AND COLD ASPHALT
'STANLITE' EXPANDED SLAG

WROUGHT IRON
FABRICATED BARS
GATES, BARRIERS, FENCING

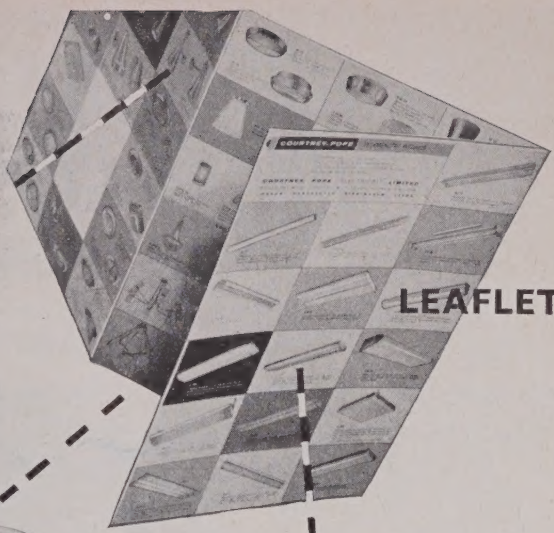
STEEL
LIGHT RAILS AND FISHPLATES
ROOFING BARS, FABRICATED BARS

BRICKS

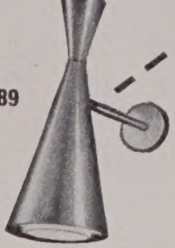
STANTON AND STAVELEY SALES LIMITED NEAR NOTTINGHAM



FA. 36

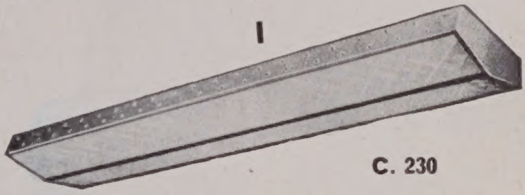


LEAFLET 101

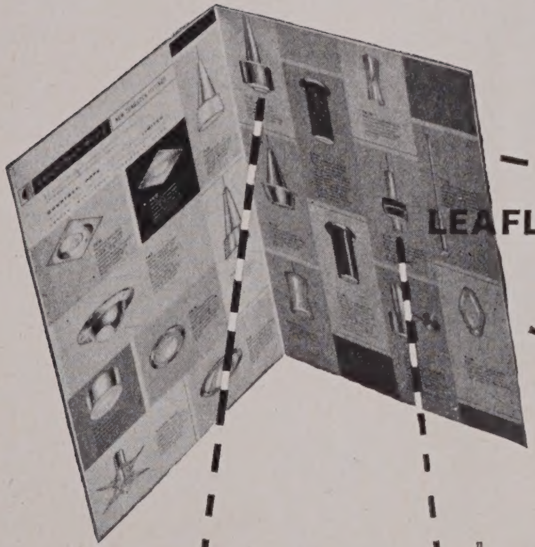


D. 89

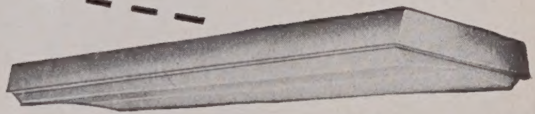
D. 110



C. 230

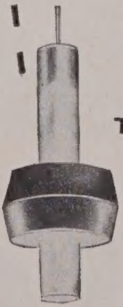


LEAFLET 102



CB. 31

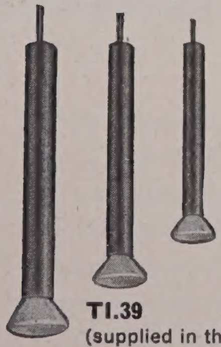
CB. 83



TI. 23

Lighting is an art and a science; it needs imagination and expert knowledge. From an unrivalled range of lighting fittings you can make the right choice. Our comprehensive service covers the supplying of single fittings to the designing of a complete lighting scheme.

If you have not already received our leaflets 101 and 102 we shall be pleased to send you copies. They include many *new* ideas.



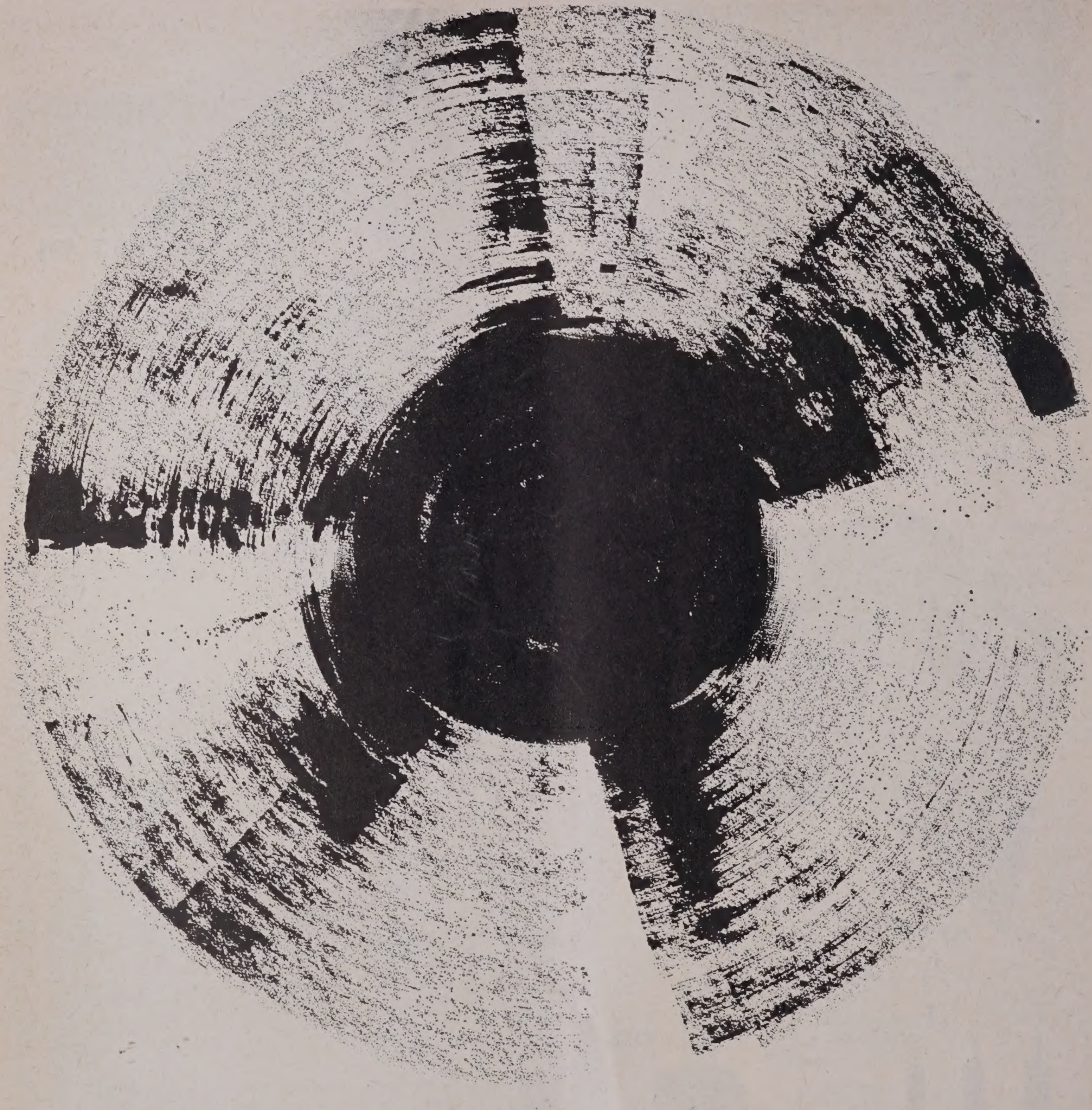
TI.39
(supplied in three sizes)

COURTNEY, POPE

THE LIGHTING SPECIALISTS

COURTNEY, POPE (ELECTRICAL) LTD
AMHURST PARK WORKS · Tottenham London N.15
Telephone: STAmford Hill 1270 *(fifteen lines)*
BRANCHES
4/10 Chatham Street, Manchester 1 (Central 1837)
Nechells House, Dartmouth Street, Birmingham 7 (Aston Cross 4541/2)
17 Wellington Street, Leeds 1 (Leeds 3-4549)

SMITHSONIAN INSTITUTION OCT 16 1961



FANS

Axial flow or centrifugal. In every case the capacity quoted is fully guaranteed. All usual requirements are covered by the standard Airscrew range with their guaranteed performance figures. Particular applications can usually be met by modified designs, made up from stock components. Where highly specialised units are called for, the great experience of Airscrew in applied aerodynamics quickly solves the problems. In every case, the result is efficiency at a competitive price.

AIRSCREW FOR FANS

THE AIRSCREW COMPANY AND JICWOOD LIMITED · WEYBRIDGE · SURREY · *WEYBRIDGE 2242*

AP 79

STC

IN CONTROL WITH ELECTRONIC IMPULSE FREQUENCY

telemetering

The increasing use of centralised control and supervision has emphasised the need for a comprehensive remote metering system. As paramount designers of remote control equipment of all types, STC is well informed of the needs of control engineers and has developed an electronic telemetering system which will meet all present day demands.

Ask for Brochures D/RC.11 and D/RC.20

- **STC Telemetering Systems can be easily modified and expanded since the systems are made up with standard plug-in units.**
- **A single line circuit can carry a number of readings.**
- **Readings can be continuous or selective.**
- **Latest electronic techniques are employed using miniature components and solid state devices.**

INDUSTRIAL
ELECTRONICS
GROUP

Standard Telephones and Cables Limited

INSTRUMENTATION AND CONTROL DIVISION

BURLEIGH HOUSE · GREAT CAMBRIDGE ROAD · ENFIELD · MIDDLESEX

61/5R

I've got a horse!

(a horse of a different colour)

and it's a winner

Winner in question is the spanking new De Luxe G.14 — superbly restyled in the fashionably " different " colour of Venetian Red. Altogether, it's the biggest De Luxe value in cleaners today. A great little cleaner that's a safe bet where the Trade is concerned, and for only 12 gns. complete. My tip is that it'll be a hot favourite where the public is concerned. Bang in line with today's spending needs, too. That's why I'm splashing the big news in big spaces in all the Big Nationals and Provincial newspapers. A winner all the way! Isn't that worth a safe stocking-up bet?

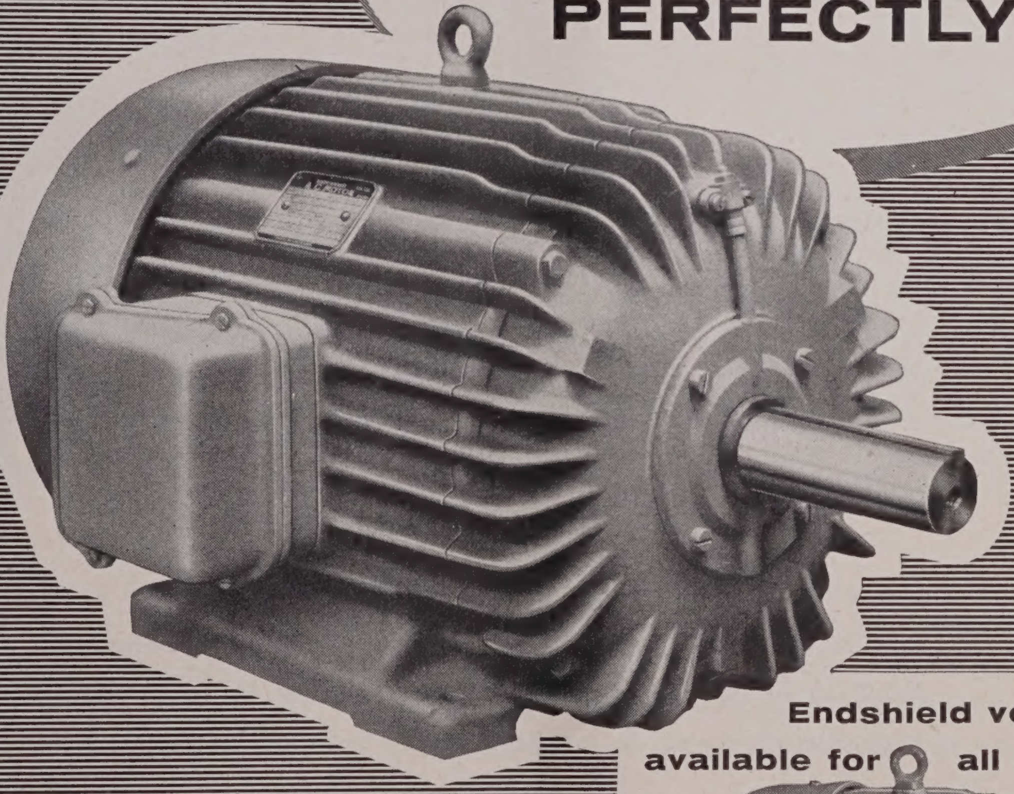
says **BILL SUTTON**

send those big orders,
please, to Bill Sutton, c/o GOBLIN

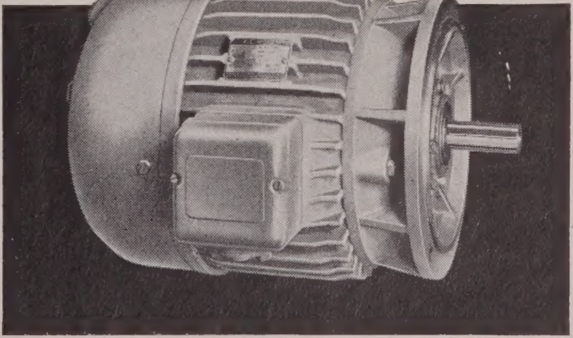
GOBLIN (B.V.C.) LIMITED, GOBLIN WORKS, LEATHERHEAD, SURREY
ASHtead 866

AEI British Standard Dimension Motors (BS2960 Pt 2)

MEASURE UP PERFECTLY



Endshield versions available for all ratings



Interchangeable with drip-proof machines to B.S. 2960 (Pt1)

Class 'E' insulation

High power/weight ratio

Compact construction

NOW AVAILABLE UP TO 60 H.P.

AEI

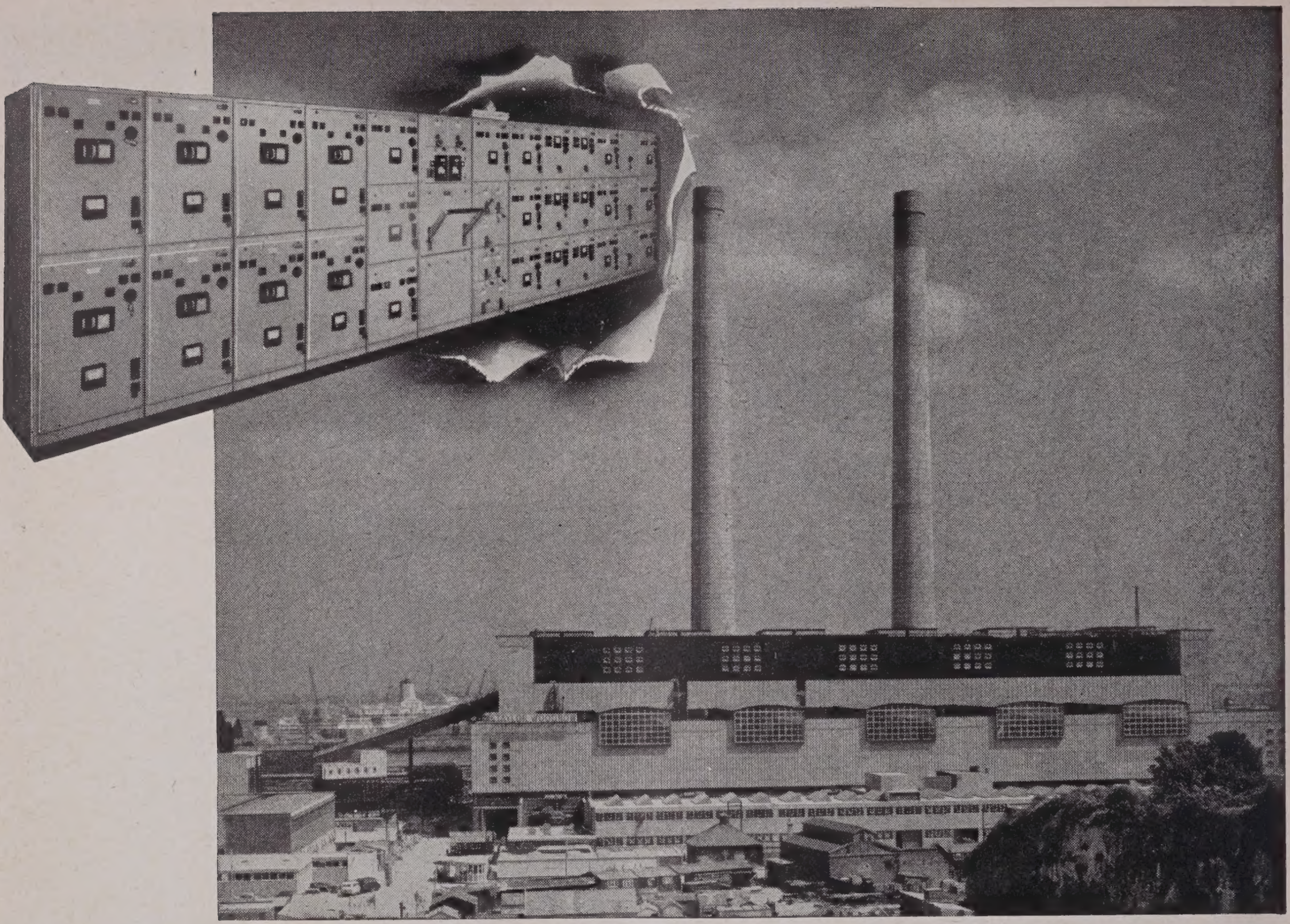
Please write for further details

Associated Electrical Industries Limited

Motor and Control Gear Division

RUGBY AND MANCHESTER, ENGLAND

A 5629



NORTHFLEET POWER STATION

THE CENTRAL ELECTRICITY GENERATING BOARD entrusted to us the contract for manufacturing and installing a wide variety of Switch and Motor Control Boards for the Main Coal Handling Plant, Boiler and Turbine Auxiliaries and Pumps, etc., for the first three Generating Sets in this New Power Station.

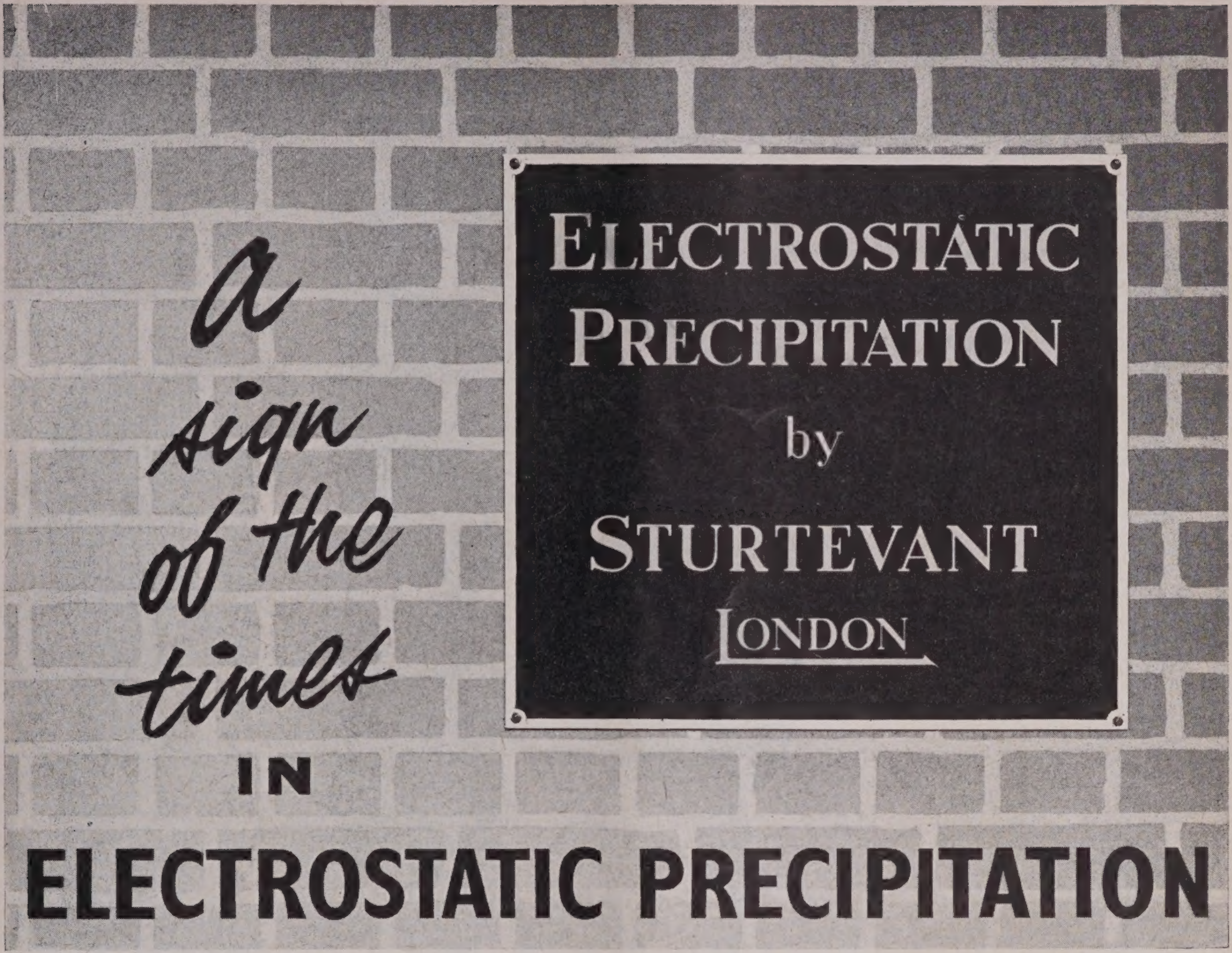
The Switchboard illustrated above is one of three controlling the Boiler Auxiliaries. They are flush fronted cubicle type, incorporating All-Isolating features, having hinged "Lift-Off" doors with Plug-in connections. Each compartment is totally enclosed and complete with separate Automatic Shutters (lockable) over main and secondary fixed isolating contacts.

ELECTRO MECHANICAL MANUFACTURING CO. LTD.

Head Office and Works: Eastfield, SCARBOROUGH
Telephone: Cayton Bay 441/2

London Office and Showroom: 133-135 Grand Buildings, Trafalgar Square, LONDON, W.C.2
Telephone: Whitehall 3530

Subsidiary of Yorkshire Switchgear and Eng. Co. Ltd.



The Sturtevant nameplate symbolises a job well done, and on those hundreds of plants in Britain and overseas where it is found it is a guarantee of the highest standards of achievement in gas cleaning and the prevention of dust emission.

SPECIALISTS IN

ALL TYPES OF FANS
HEATING AND VENTILATION
AIR CONDITIONING
AIR FILTRATION
FUME REMOVAL
DRYING
DUST COLLECTING
ELECTROSTATIC PRECIPITATION
PNEUMATIC CONVEYING
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Sturtevant CLEAN AIR

STURTEVANT PRECIPITATORS COLLECT

Boiler Flue Dust · Coal Dust · Metallic Oxides · Selenium Fumes · Precious Metals · Pyrites · Acid Mist · Ceramic Dust · Aluminium Silicate · Limestone · Asbestos · Sugar · Phosphate Dust · Chalk · Cement Dust · Carbon and Carbon Black.

Publication U7018 giving particulars of Sturtevant Electrostatic Precipitation will be sent on request

STURTEVANT ENGINEERING CO. LTD., SOUTHERN HOUSE, CANNON STREET, LONDON, E.C.4

AUSTRALIA: STURTEVANT ENGINEERING CO. (AUSTRALASIA) LTD., MILLER ROAD, VILLAWOOD, N.S.W.

For their new telephone junction boxes,
the G.P.O. put in a call for Styron 475*—
today's high impact polystyrene!
It has extra strength to resist knocks and abrasions . . .
is easy to mould . . . has excellent
electrical properties that meet the most
stringent specifications. Styron is light
in weight and available in a wide range
of fade-free colours. It enables
manufacturers to build maximum performance
and superb appearance into all types
of low voltage electrical equipment.
Put in a call for Styron now
or write today for
Booklet No. 235.

*Styron is a trade mark
of the Dow Chemical
Company USA

manufactured by
Distrene Ltd.

*G.P.O. block terminal No. 30
moulded by Insulators Ltd.,
London N.18*

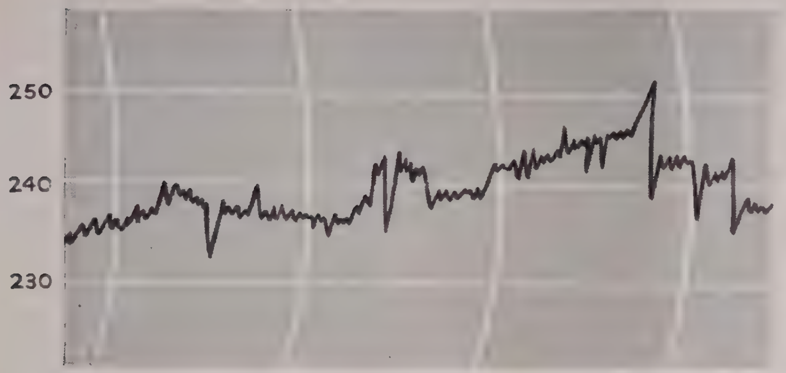
Sole Selling Agents

British Resin Products Ltd A COMPANY IN THE DISTILLERS PLASTICS GROUP BRP

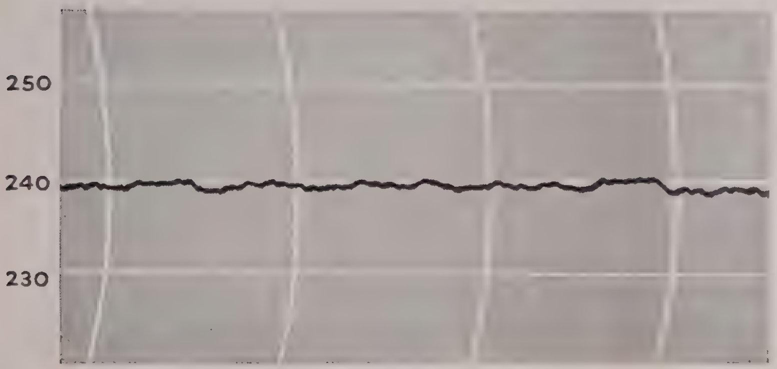
SALES AND TECHNICAL SERVICE DEVONSHIRE HOUSE PICCADILLY LONDON W1 HYDE PARK 0151

Distillers Plastics Serve Everyman

This recording is typical of line voltage conditions in an industrial establishment where voltage variation is a problem.

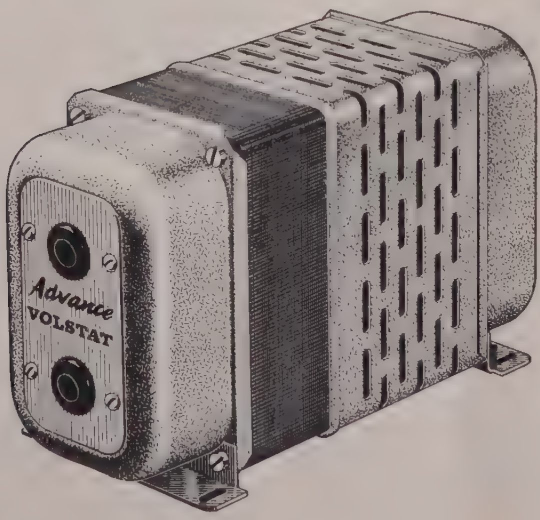


FLUCTUATING VOLTAGE



becomes constant with a

VOLSTAT



A VOLSTAT is the answer to many voltage fluctuation problems. In most cases, a standard type is all that is required—but there are occasions when a special design may be necessary. Either way, an 'Advance' Technical Representative will be pleased to investigate your own particular problems, and recommend a VOLSTAT best suited to your needs. VOLSTAT stands for a complete range of Constant Voltage Transformers produced by 'Advance'—the leading authority on voltage stabilization. Full details in Folder D63 available on request.

Advance COMPONENTS LIMITED

MAINS STABILIZATION DIVISION
ROEBUCK ROAD · HAINAULT · ILFORD · ESSEX · HAINAULT 4444

SBVC/2

The choice is often difficult

choosing a winner calls for expert judgment . . .

. . . and it's the same when choosing between Die Castings and Hot Pressings. For expert advice come to us, for we make *both!* The special experience of our organisation — two separate yet inter-related operations under one roof — is your guarantee of obtaining the correct unit for *your* needs.
Whenever you require a constant or phased supply of dimensionally accurate parts in *Brass, Bronze, Copper* or *Aluminium* — see us first! Our technical representatives are always at your service.

BRASS PRESSINGS (LONDON) LTD • THE NON-FERROUS DIE CASTING CO. LTD.

NON-FERDICA WORKS, NORTH CIRCULAR ROAD, LONDON, N.W.2. *Telephone: GLAdstone 6377*

1731

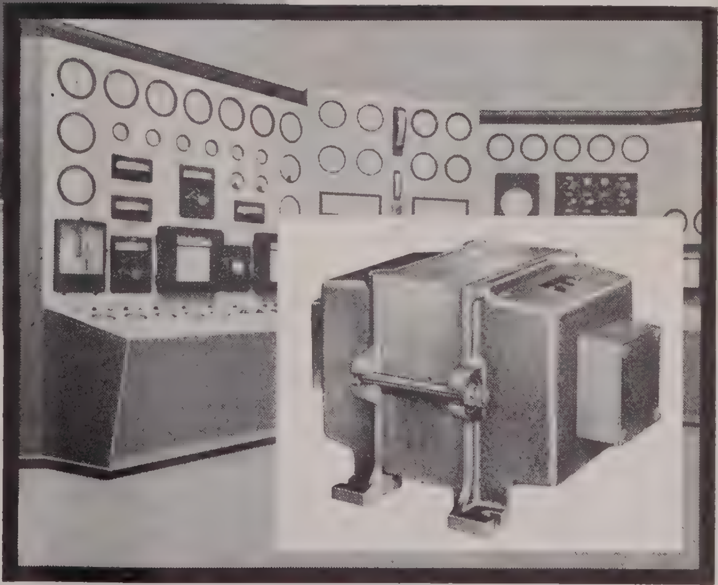
ZENITH

The second illustration shows a typical Kent instrument panel forming the basis of a composite automatic control scheme. When remote indication is required for the Kent R SC. rotary shunt totalizing steam meter, *ZENITH fixed ratio transformers are used to provide the power for an additional integrator. A similar supply source is used for water, air and gas.

Reliability in the smallest of components is essential to smooth and safe working. This quality is built into our transformers which are available up to 35 kVA, both single and three-phase, types A.N. and O.N. Our experience is at your service when the difficult single application causes cogitation.

Registered Trade Mark

Photographs by courtesy of the Central Electricity Generating Board and Messrs. George Kent Ltd



Power Stations

THE ZENITH ELECTRIC COMPANY LIMITED

ZENITH WORKS · VILLIERS ROAD · WILLESDEN GREEN · LONDON N.W.2

Telephone: WILLESDEN 6581/5 Telegrams: "VOLTAOHM, NORPHONE, LONDON"

Temperature control?

Ring for

Otter

REGD.

THERMOSTATS AND
SAFETY CUT OUTS

BUXTON 650 (2 lines)

Otters press their contacts together to open them with a SNAP!

Thermostats and Safety Cut Outs for the control and protection of :-

Convector Heaters, Water Heaters, Fan Heaters, Washing Machines, Clothes Dryers, Hair Dryers, Electric Blankets, Electric Motors.

Otter thermostats are permanently and accurately set to give reliable temperature control.

The high contact pressure of all Otter thermostats ensures reliability even in bad conditions of dust and dirt.

OTTER CONTROLS LTD

OTTERS 'OLE, BUXTON, DERBYSHIRE. PHONE BUXTON 650 (2 LINES)

WORLD PATENTS INCLUDING PATENT NUMBERS 600055, 622781, 624905, 657434, 713443, 749716, 774911, 782668 AND OTHERS. ALSO OTHER PATENTS PENDING

O/4

QUITE the most successful cooker ever made—there has never been anything like it in the history of the electrical industry. The facts speak for themselves:—

Since the first model was introduced in '47, well over three quarters of a million have been sold, and more of these cookers are in use than any other cooker sold to-day.

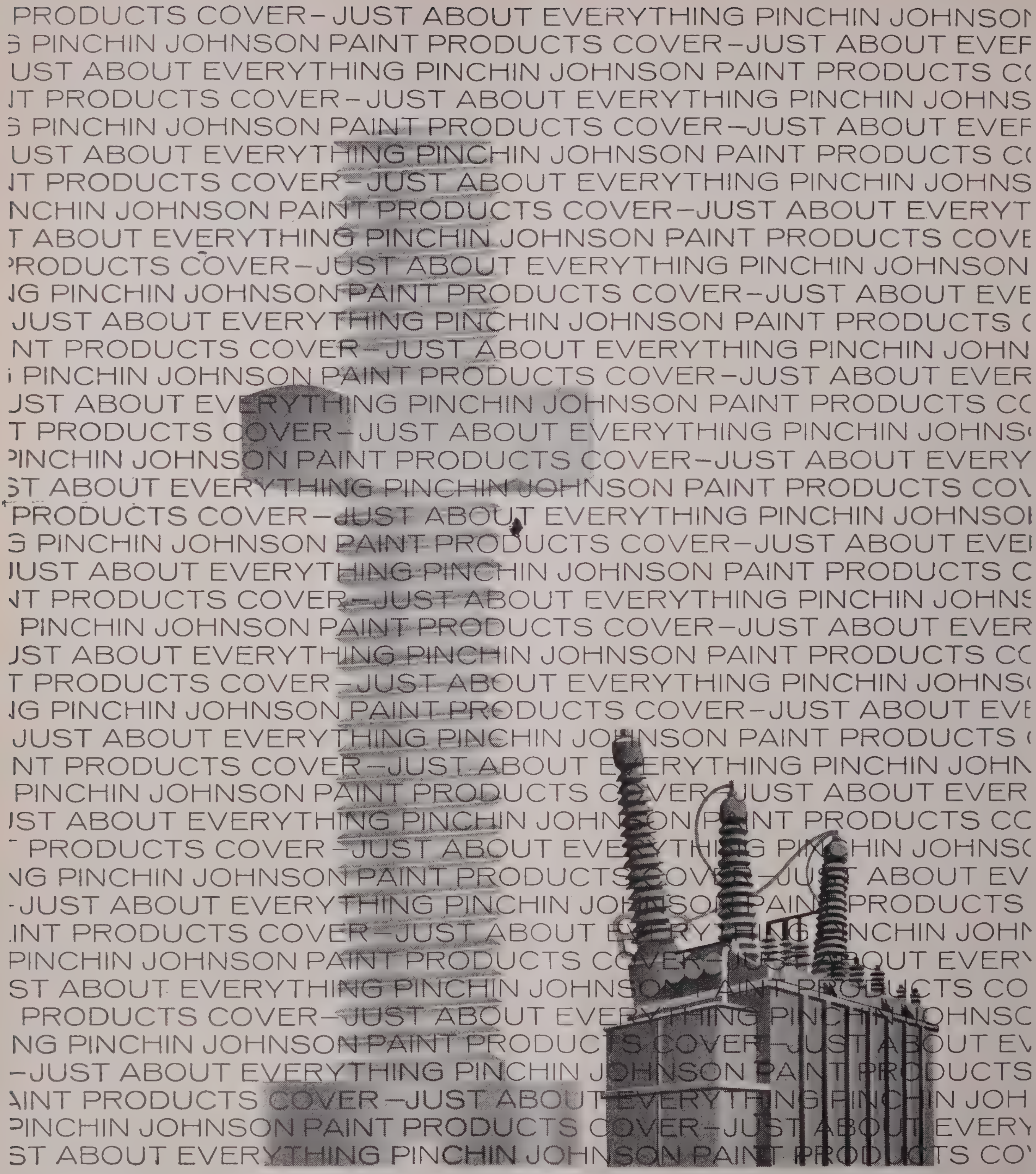
It has been heavily—and consistently—advertised over the years and has never given anyone a moment's trouble.

Its cooking is renowned and it has a reputation second to none for reliability. Its features include an inner glass door, a large 3-shelf oven with a balanced 3-element heating system, removable oven roof and lining, EDA grill-boiler and 2 EDA boiling plates and a hotcupboard with a drop-down door.

It continues to sell better than ever. No wonder! At £37.15.0, it's still the finest value in popular family cookers on the market.

Should you have any questions to ask, the telephone number is HOWard 1212.

CRC/BET/489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From minute electronic assembly to power engineering, electrical manufacturers make use of Pinchin Johnson products. Externally, protective paints—internally, specialised insulating enamels, varnishes and compounds ensure reliable operation in all conditions. Interesting or unusual applications of Pinchin Johnson products are described in every issue of *Top Cover*. Let us know if you would like to see future copies.

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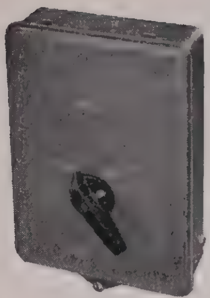
'HIDUTAC' switchfuses pack more space into a smaller size



Radial positioning of the contacts of 'Hidutac' switchfuses allows a *unique compactness.* This is just one of many 'Hidutac' exclusive features resulting from G.E.C. Installation Equipment Group's *new approach,* based on many years' experience of making switchgear superbly well. The 60 amp. TPN 'Hidutac' measures only $13\frac{3}{16} \times 8\frac{1}{2} \times 4\frac{1}{2}$ in. yet there is still generous wiring space and easy access to the terminals at the front.

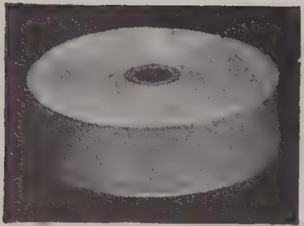
Consider these other impressive advantages: *Unlimited full load switching*—'Hidutac' switchfuses operate at their full load current with unfailing reliability. *High breaking capacity*—8 times the rated full load current—through cam-operated, double-break, silver contacts. *Total internal enclosure* of all moving parts, with shields over live terminals. *High fault current protection* in Single Pole and Neutral, Double Pole, Triple Pole, Triple Pole and Neutral switchfuses with H.R.C. or rewirable fuses. Categories of duty are: H.R.C. fuses, all ratings, AC4 of BS88 (33,000 amp.); rewirable fuses, 15 and 30 amp. ratings, S2A of BS3036 (2,000 amp.); rewirable fuses, 60 amp. rating, S4A of BS3036 (4,000 amp.). *Modern styling* of pressed steel case with fully interlocked cover.

These exclusive features make 'Hidutac' switchfuses vastly superior for tungsten and discharge lighting control, motor control, and transformer and capacitor switching.

***IMMEDIATE DELIVERY** of 'Hidutac' switchfuses from wholesalers throughout the country. For more detailed information ask your wholesaler for 'Hidutac' literature.*

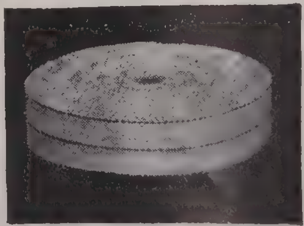
that's the New Approach of G.E.C.

INSTALLATION EQUIPMENT GROUP



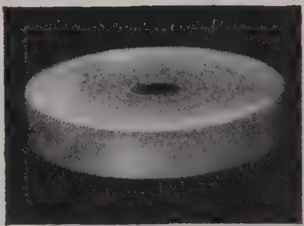
DURAGLAS
Regd.

"Duraglas" Glass-fibre Tapes have many applications within the electrical insulation field such as conductor insulation, coil wrappings, core bindings, mechanical reinforcements, cable wrappings, and heat resistant protective coverings.



PYROFLEX
Regd.

"Pyroflex" Asbestos Listing Tape has been specially designed for the electrical industry. "Pyroflex" is manufactured from carefully selected and purified fibres, and is suitable for a wide range of electrical insulation applications.



p.t.f.e.

p.t.f.e has exceptionally good di-electric properties, is non-tracking, non-flammable, resistant to moisture and totally unaffected by weathering conditions. As a result it has a wide application in the electrical industry in the form of tape for the insulation of cables, motors and transformers.

TURNERS TAPES DESIGNED TO COVER ALL INSULATION REQUIREMENTS

TURNER BROTHERS ASBESTOS CO LTD ROCHDALE ENGLAND

A MEMBER OF THE **TURNER & NEWALL** ORGANISATION

TA251

Tough, rugged, dependable Belmos flameproof switchgear was chosen by the Iraq Petroleum Company Limited for installation in a large tank farm in the Middle East where sun and sand combine to make the severest of operating conditions. It is not surprising that Belmos should be the choice of discerning engineers who know that over 40 years of experience, gained exclusively from the design, development, and manufacture of motor control gear, are "built-in" to every Belmos unit.

IRAQ
PETROLEUM
CHOSE
BELMOS

the Belmos company limited
BELLSHILL — LANARKSHIRE

Belmos

LONDON GLASGOW BIRMINGHAM NEWCASTLE MANCHESTER SHEFFIELD CARDIFF

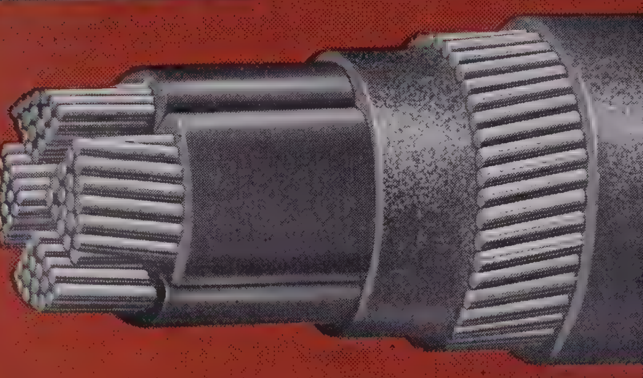
PAM 4058

60 YEARS OF PROGRESS . . .

P.V.C. INSULATED POWER CABLES

Available for the same conductor range as for Paper Insulated Cables, to B.S. 480/1954, for voltages up to and including 3.3 Kv.

Send for publication No. B16

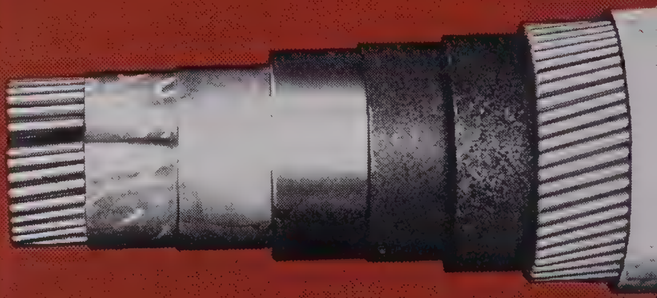


CONNOLLYS

PAPER INSULATED POWER CABLES

Standard range covers 1,100 volts to 11,000 volts with full range of armouring and overall protection with bituminous textiles or P.V.C.

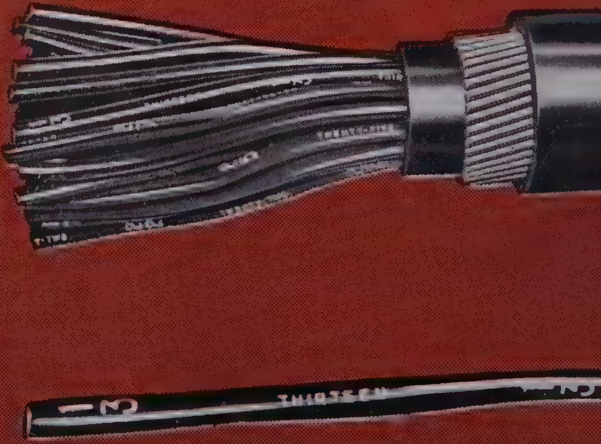
Further details on request.



PILOT AND CONTROL CABLES

A range of [illegible] cables is available at [illegible] identification, the P[illegible]ly printed at frequent interv[illegible] legend and numerals. The laid up co[illegible] with P.V.C. and can be armoured and P.V.C. protected if required.

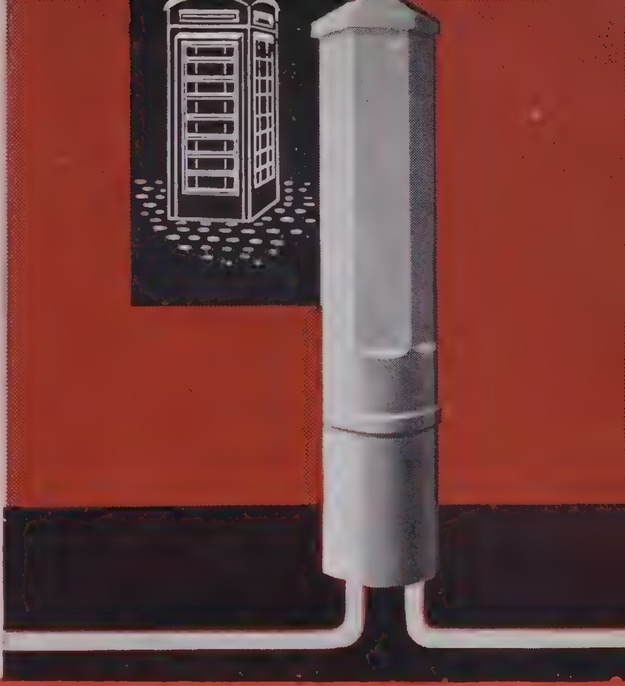
Further details on request.



TELECOMMUNICATION CABLES

Connollys plastic insulated and sheathed cables are servicing telephone administrations throughout the world. Cables can be armoured with protected galvanised steel if there is a danger of mechanical damage, or they can be supplied with inbuilt catenary for overhead suspension. All cables are suitable for installation in tropical conditions.

Send for publication B.11A (Polythene Insulated)
and publication B.14A (P.V.C. Insulated)

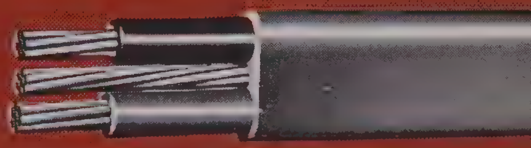


FOR CABLES

WIRING SYSTEM CABLES

Connollys stock a wide range of plastic insulated and sheathed cables in accordance with B.S. 1557 (Polythene insulated, P.V.C. sheathed) and B.S. 2004 (P.V.C. insulated, P.V.C. sheathed).

Further details on request.



'BLACKLEY' INSULATING TAPE

'Blackley' Tape has been produced by Connollys since 1895 and its adhesive and insulating properties are appreciated throughout industry. The adhesive surfaces never 'strip' because the rubber compound is frictioned on to both sides of specially woven cloth. Available in widths ½" to 2" in 5, 10, 25 and 50 yard rolls.

Send for publication No. B.12.

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Tel: Victoria 4991-2. Telex: 33-309

NEWCASTLE-UPON-TYNE, 1: 6 Baltic Chambers, Quayside
Tel: Ponteland 3128

LEIGHTON BUZZARD: Vimey Drive. Tel: 3470

CABLE DIVISION

CONNOLLYS (BLACKLEY) LIMITED

HEAD OFFICE AND WORKS **MANCHESTER 9** Tel: CHEETHAM HILL 1801 Grams: CONNOLLYS BLACKLEY

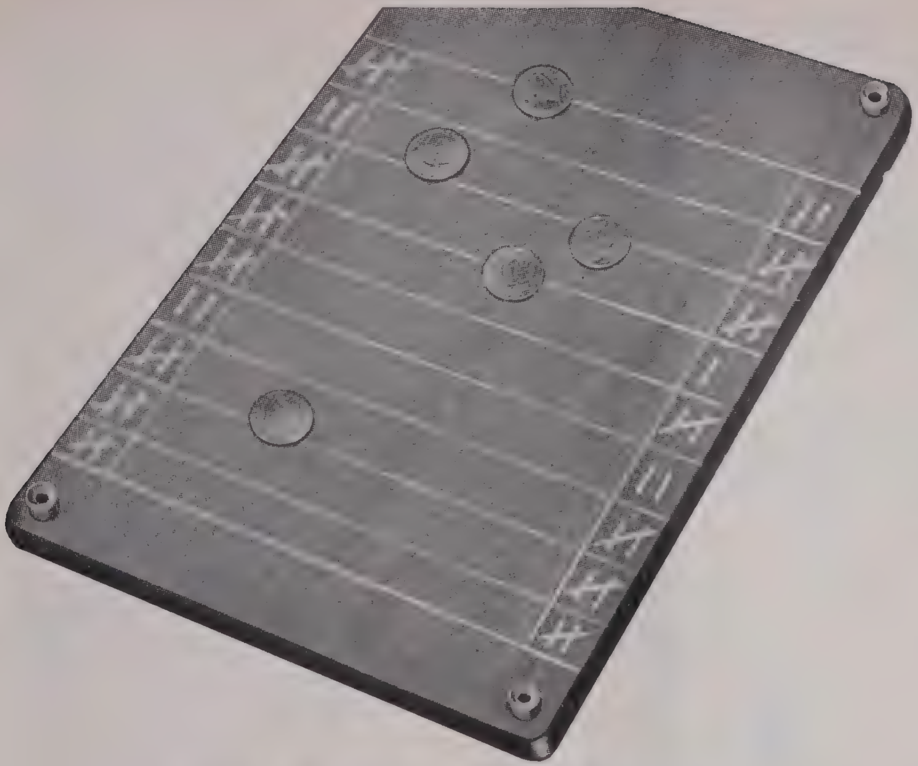
CL.54

The A E I Cable Division is a new entity. But it is not so new in other ways. It has men in it you know and trust—men you've done business with before. It has comprehensive stocks of **wiring cables and flexible cords**—located through a network of sales outlets all over the country. And it now offers the well-known Eager Beaver Service for these cables. Hard Work. Willingness. Resourcefulness. A whole team of Beavers anxious to assist you with your day-to-day wiring cable requirements. That's what the A E I Cable Division owes you, and it much looks forward to having an opportunity of discharging the debt.

AEI

CABLE DIVISION

Associated Electrical Industries Limited
Cable Sales Department
51/53 Hatton Garden · London · EC1 · Tel: CHAncery 6822



Wootton meter boards win every time!

Obviously, when they're Wootton-made, and Wootton-tested. Made from the best plywood Wootton could lay hands on. Tested for reliability . . . toughness . . . durability. Wootton meter boards stand up to anything. No contraction or expansion warping with Wootton! Oh, and there's more to Wootton than just meter boards. They make wood blocks too, and instrument cases, and they're brilliant at sunk switch boxes.

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STILL! NO OTHER LAMP HAS ALL ITS FEATURES

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By Appointment to
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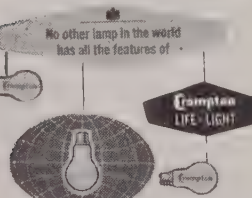
YOU KNOW WHAT THESE FEATURES OF 'LIFE-LIGHT' ARE: **LONG LIFE, FULL LIGHT OUTPUT; RESISTANCE TO SHOCK; LOW CURRENT CONSUMPTION, THEY CAN BE USED ANY WAY UP; A PATENT SHATTER-PROOF FUSE.** YOU KNOW **WHY** 'LIFE-LIGHT' LAMPS ARE BETTER—THE FULL STORY IS IN THE COUNTER LEAFLET.

And no other lamp has this new and successful advertising

Last year, you remember, we did something entirely new in lamp advertising. We didn't use gimmicks or slogans but explained exactly *why* 'Life-light' was a better lamp. This campaign caused more comment than any lamp advertising for years and we are going on with the same theme because it is the kind of advertising that is cumulative, but we are doing far more of it. In all, these advertisements will be seen over 80 million times. So this year they will do even more to increase your sales.

Crompton LIFE-LIGHT

To help you sell these lamps hard we are offering you this point-of-sale and display material. Use it. See your customers buy the lamp that sheds a bright light on your good name.

1


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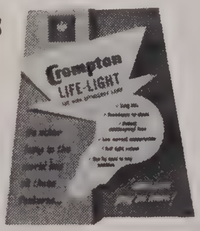

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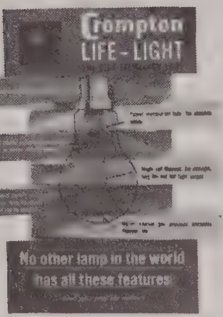


4

1. MOBILE. This well balanced and attractive mobile can be used in the window or in the shop.

2. LARGE DISPLAY. This forms the centre piece of a window display or alternatively can be used as a large showcard inside the shop.

3. SHOWCARD. Carries on the 'Life-light' theme. Attractive and striking to look at and takes up very little space. Use on the counter to attract attention.

4. LEAFLETS. These leaflets are your best aid to selling 'Life-light'. They tell the customer exactly why 'Life-light' is a better lamp. They mean repeat buying so see that they are picked up.

DISPENSER
This compact floor dispenser which is 61 in. high and only 13 in. square is a valuable sales aid for use inside your shop.

ALSO THIS YEAR:- Sales material for the

CROMPTON 'NEWSHAPE' LAMP

1. SHOWCARD. Clean, bright and attractive. Use it to draw attention to this very popular lamp.

2. LEAFLETS. Keep them near showcard; they are powerful selling aids.

Note. Crompton 'Newshape' has the same internal construction as 'Life-light': It is thus as much in advance of other lamps with this new bulb as 'Life-light' is in advance of other lamps of the ordinary shape.

1

2

ELECTRICAL EQUIPMENT

CROMPTON PARKINSON LTD., CROMPTON HOUSE, ALDWYCH, LONDON, W.C.2.

For the MONT BLANC tunnel

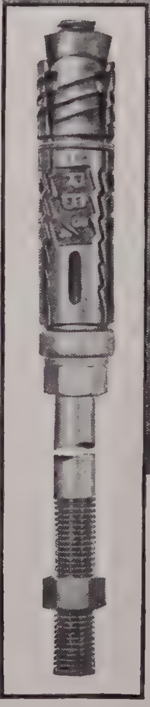
many thousands of RAWLPLUG ROOF BOLTS

A feature of this 12 million pound project—a 7-mile road tunnel through Mont Blanc—is the use of the world's most modern machinery and techniques to ensure the utmost speed and efficiency. Rawlplug Roof Bolts are here being used in tens of thousands for bolting rock strata above the tunnel, for fixing roof supports and protective netting, and for holding rigidly in place the enormous ventilation and extraction tubes. Rawlplug Roof Bolts are today an essential part of successful mining and tunnelling operations.

(photograph above right)
Steel panels and protective netting held by Rawlplug Roof Bolts. The 7′ 2″ diameter ventilation tube is also held by Rawlplug Roof Bolts. (Atlas-Copco "Lion" rock drills are driving the tunnel from a 30-ton, four-decked drilling platform)

Write now for full technical details for your reference files.

Photographs by courtesy of Societa Italiana per Condotte D'Acqua di Roma



RAWLPLUG ROOF BOLTS have these special features:

(1) Shields and studs can be placed and hand tightened at desired depth prior to assembly of plates, beams, etc.

(2) No setting tool or special gear required.

(3) Can be tightened either with an impact wrench, nut runner or manually, using keys or torque spanners.

(4) Rawlplug Roof Bolts are recoverable.

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SUB-ARCTIC COLD: EQUATORIAL HEAT:

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For details of our range of Conduit Fittings write for illustrated catalogue No. F 459.

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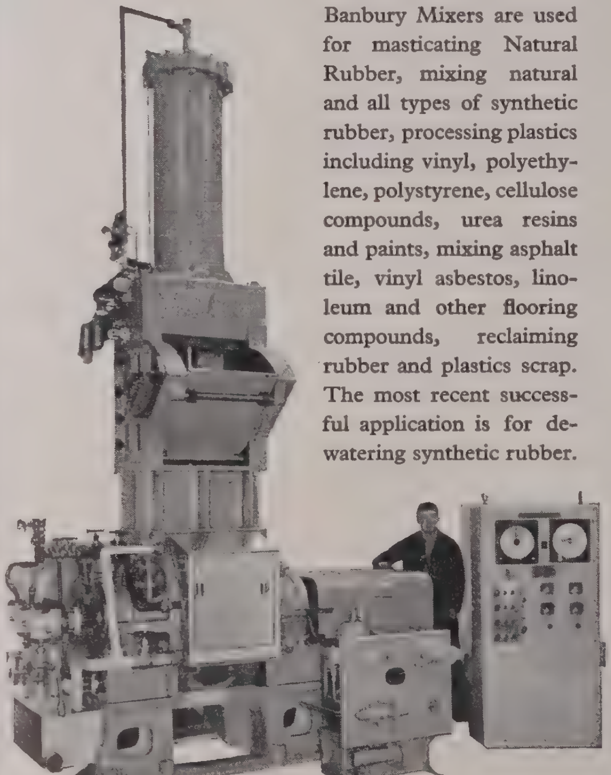
BANBURY MIXERS

David Bridge & Co. have more than 40 years experience of building Banbury Mixers, and during that period detailed design features have been constantly improved while still retaining the basic operating principles of the machine. The changes made have shortened total cycle times, improved cleanliness, reduced maintenance and increased operating efficiency generally. Material produced in a Banbury Mixer is of consistent High quality.

Banbury Mixers are used for masticating Natural Rubber, mixing natural and all types of synthetic rubber, processing plastics including vinyl, polyethylene, polystyrene, cellulose compounds, urea resins and paints, mixing asphalt tile, vinyl asbestos, linoleum and other flooring compounds, reclaiming rubber and plastics scrap. The most recent successful application is for dewatering synthetic rubber.



NEW FEATURES INCLUDE:—

Hydraulically operated drop type door, Higher operating ram pressures, Unidrive gearing, Special High H.P. high pressure Mixers, Hard Surfacing, Automatic control systems. Some of the above are optional, others are available for specific mixing requirements.

DAVID BRIDGE & COMPANY LTD.

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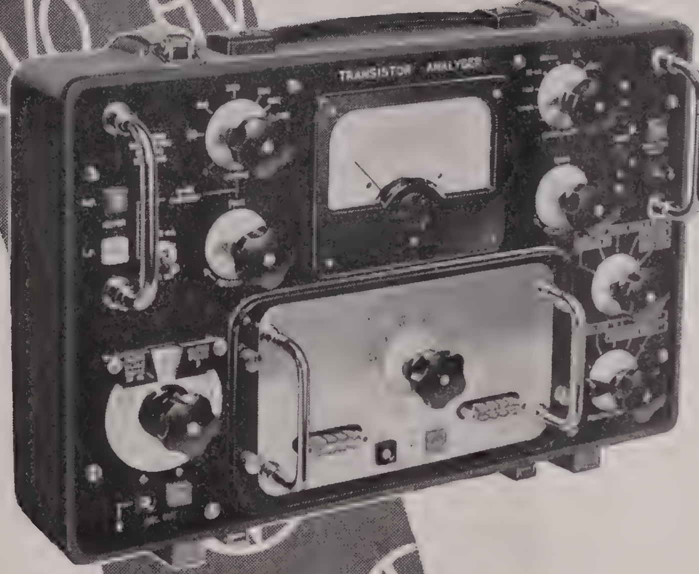
INSTRUMENTS OF THE FUTURE NOW by AVO



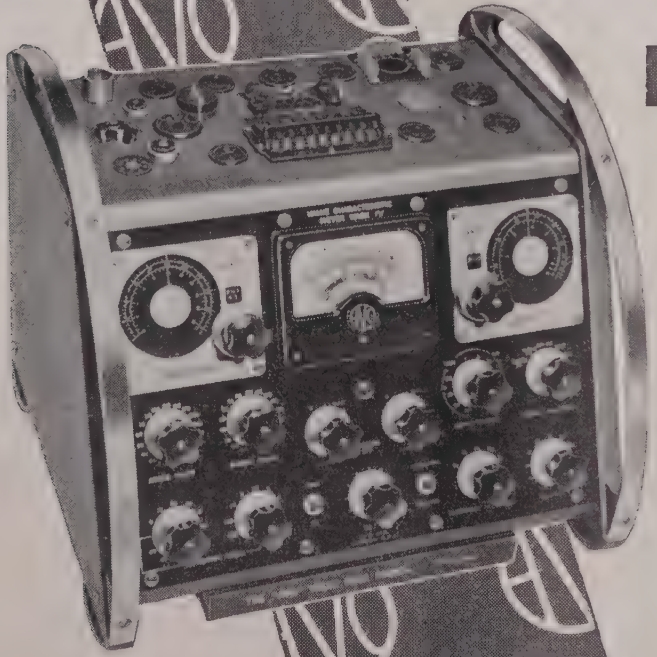
NEW AVO TRANSISTOR ANALYSER

A portable battery-operated instrument, suitable for testing PNP, NPN and Point Contact transistors, in the grounded emitter configuration. Provision is included for *in situ* measurements. The instrument is supplied complete with comprehensive operating instructions, together with the AVO International Transistor Data Manual which provides test data for approximately 3000 transistors.

Brief Specification:

Range of Collector Voltage:	1·5V to 10·5V (up to 150V using external supplies)
I'co:	First indication 2μA
Base Current:	0-1 mA, 0-40 mA
Collector Current:	0-1A
Beta:	0-25, 0-250 measured at 1 Kc/s
Noise Measurement:	1-20, 21-40 dB

Construction in general conforms with U.K. Inter-Service Spec. K114.



NEW AVO VALVE CHARACTERISTIC METER Mk. IV

This instrument has been designed to test any standard receiving or transmitting valve having up to a maximum anode dissipation of 25W. Inter-electrode insulation, anode current, mutual conductance and 'gas' current can be measured, and by making a series of tests, complete families of curves may be plotted. Rectifiers and signal diodes are tested under suitable load conditions. A comprehensive data manual is supplied with the instrument, which operates from 100-120 volts and 200-260 volts 50-60 c/s A.C. mains.

Brief Specification:

Range of Anode Voltage:	12·6 — 400 volts
Range of Screen Voltage:	12·6 — 300 volts
Range of Heater Voltage:	0·625 — 117·5
Heater Current:	3A max.
Anode Current:	100 mA max.
Mutual Conductance:	0·1 — 60 mA/V max.
Negative Grid Voltage:	0 — 100V in 9 ranges
'Gas' Current:	2μA first indication

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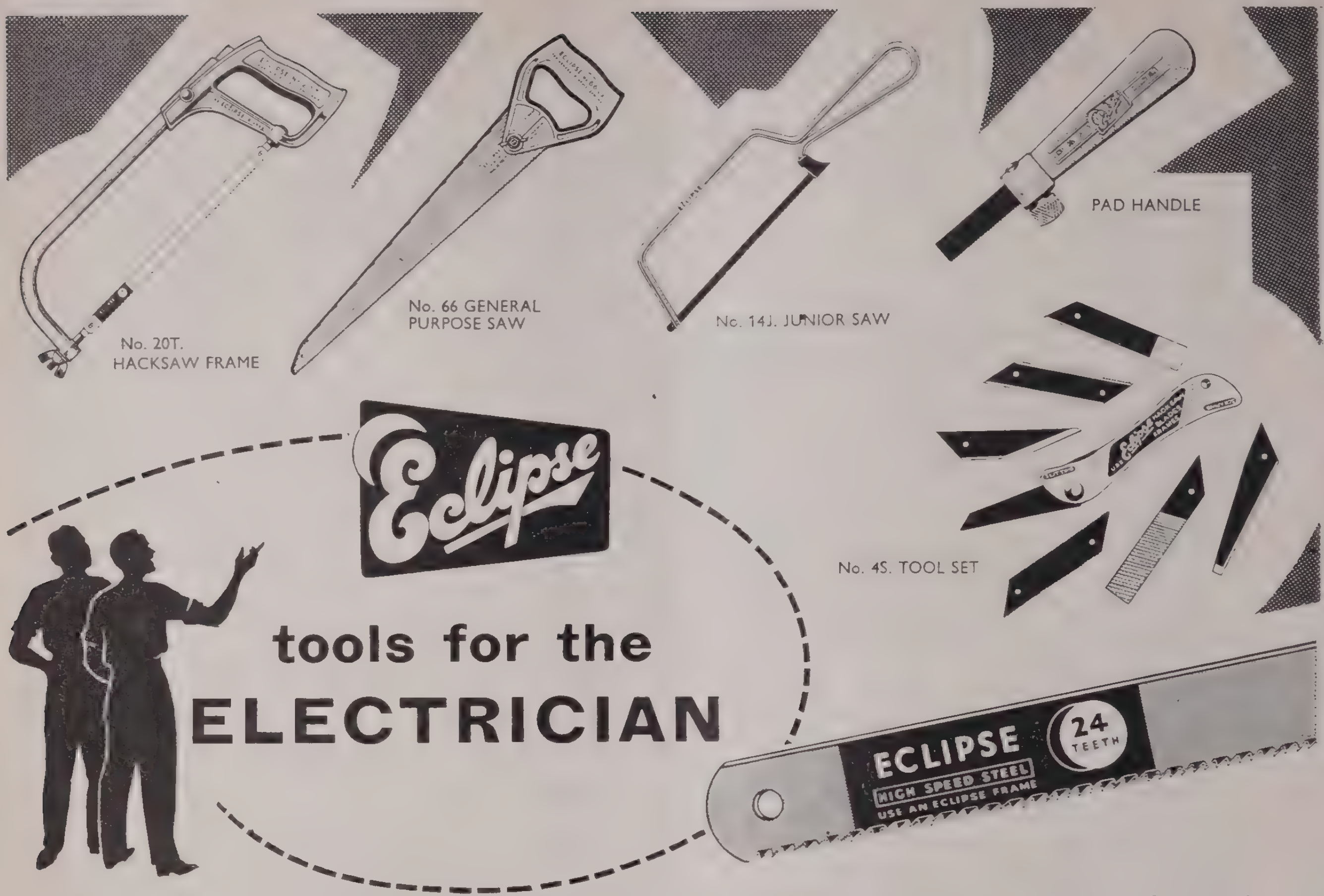
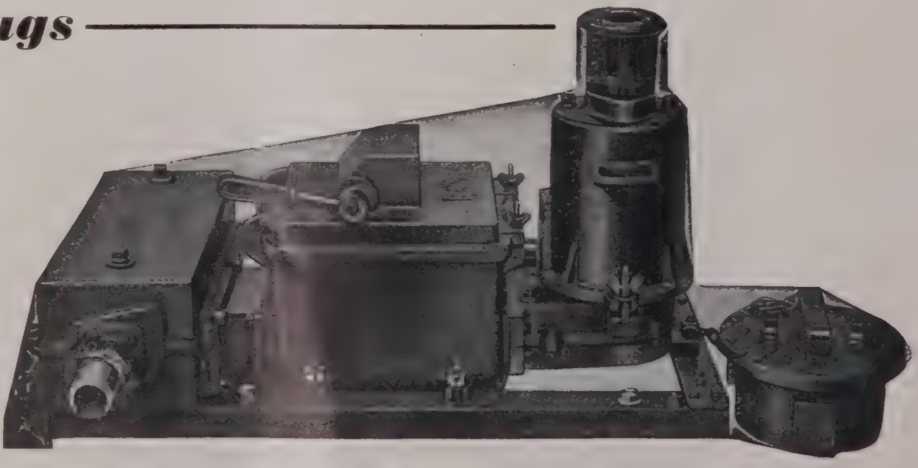


Made by James Neill & Co. (Sheffield) Ltd. and obtainable from your usual supplier

SSA 32

Watertight Plugs and Sockets for Outdoor Crane Work

There are several arrangements of Weekes' W/T Plugs and Sockets and one of the modified forms is that designed for use with a travelling crane.



This dock plug is for installation in a pit, or on ground level

The travelling crane passes directly over the plug and socket, and the slack in the flexible trailing cable is wound on a drum, thus making it unnecessary to un-plug and re-connect when the crane passes the plug point. The plug and socket swing through a maximum angle of 220°.

All designs of Weekes' Watertight Plugs and Sockets can be made in ratings up to 300 amps. 500 volts, with two, three or four contact pins.

Advise us of your requirements; we can probably meet every one of them.

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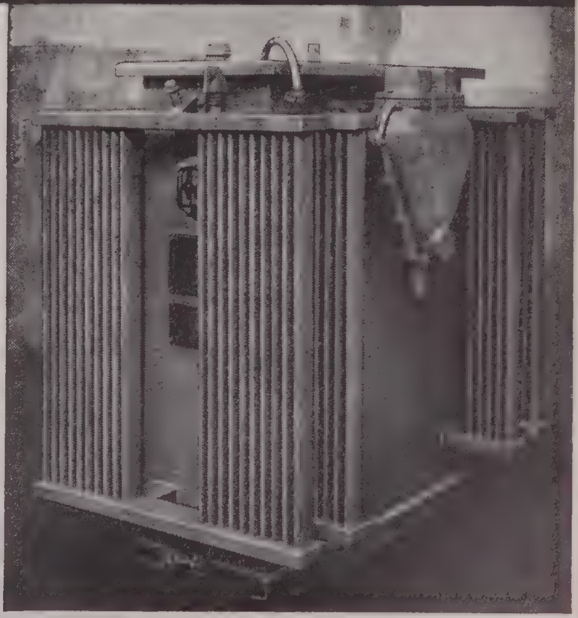
"NATURALLY, IT'S THE BRUSH T1"

The low noise level of the present range of Brush T.I Distribution Transformers has to be heard to be really believed—and that's not the only advantage. Their compactness is surprising too. The British T.I. series will be particularly appreciated by authorities who find it necessary to increase output of their existing transformer sub-stations to meet increasing demands for power, without carrying out major alterations to buildings. A modern Brush 500 kVA transformer can be placed in a sub-station building originally designed for a 300 kVA transformer, and with room to spare!

BRUSH

A member of the Hawker Siddeley Group.



BRUSH ELECTRICAL ENGINEERING CO. LTD · LOUGHBOROUGH · ENGLAND

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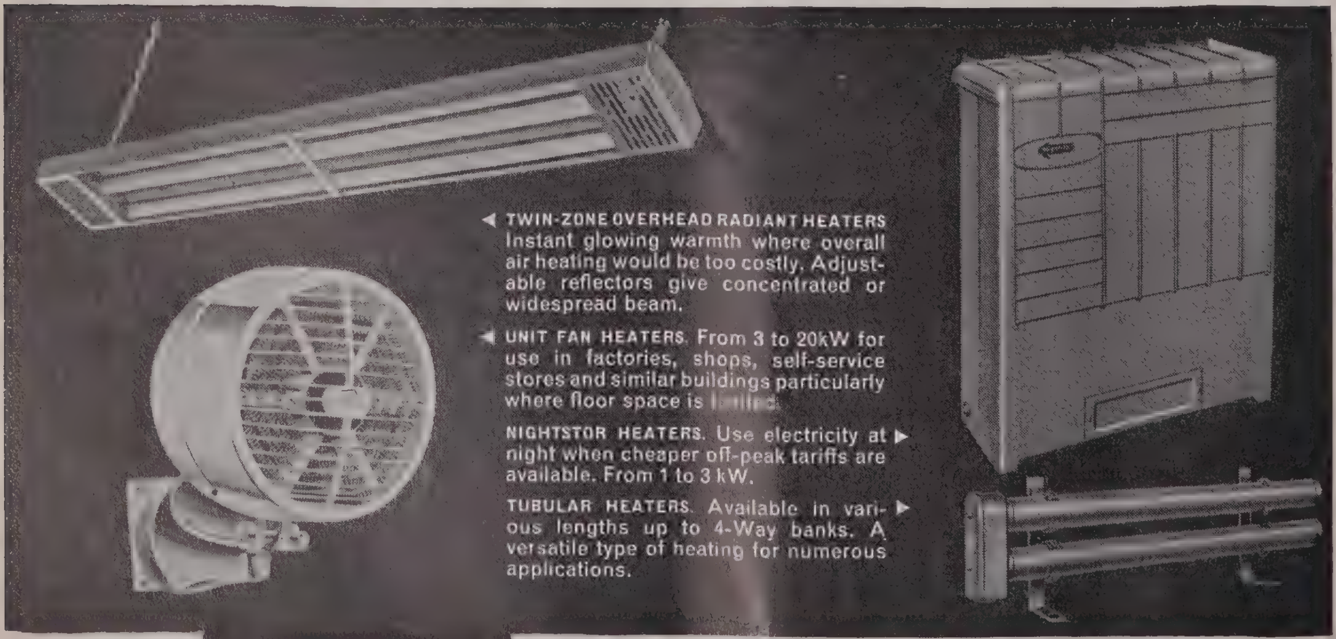

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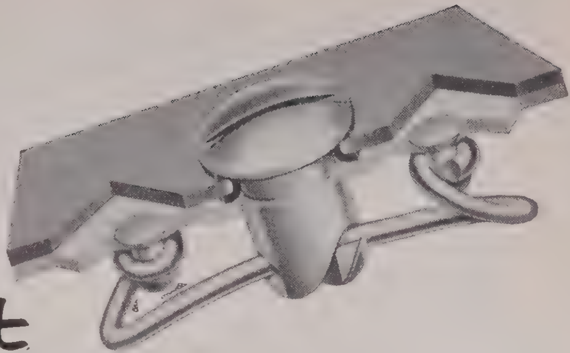

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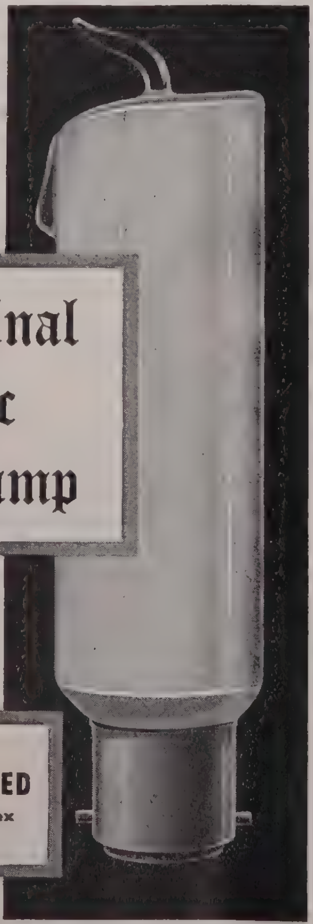

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Commander Shepard's flight in Freedom 7 was a triumph for Mercury in a special sense. The designers who built into his capsule a return ticket to earth also created new proving ground for Mallory Mercury batteries. These miniature high energy sources powered many of the instruments in Shepard's capsule.
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And they won another 'first' when they pushed signals from Pioneer IV across more than 400,000 miles of space.
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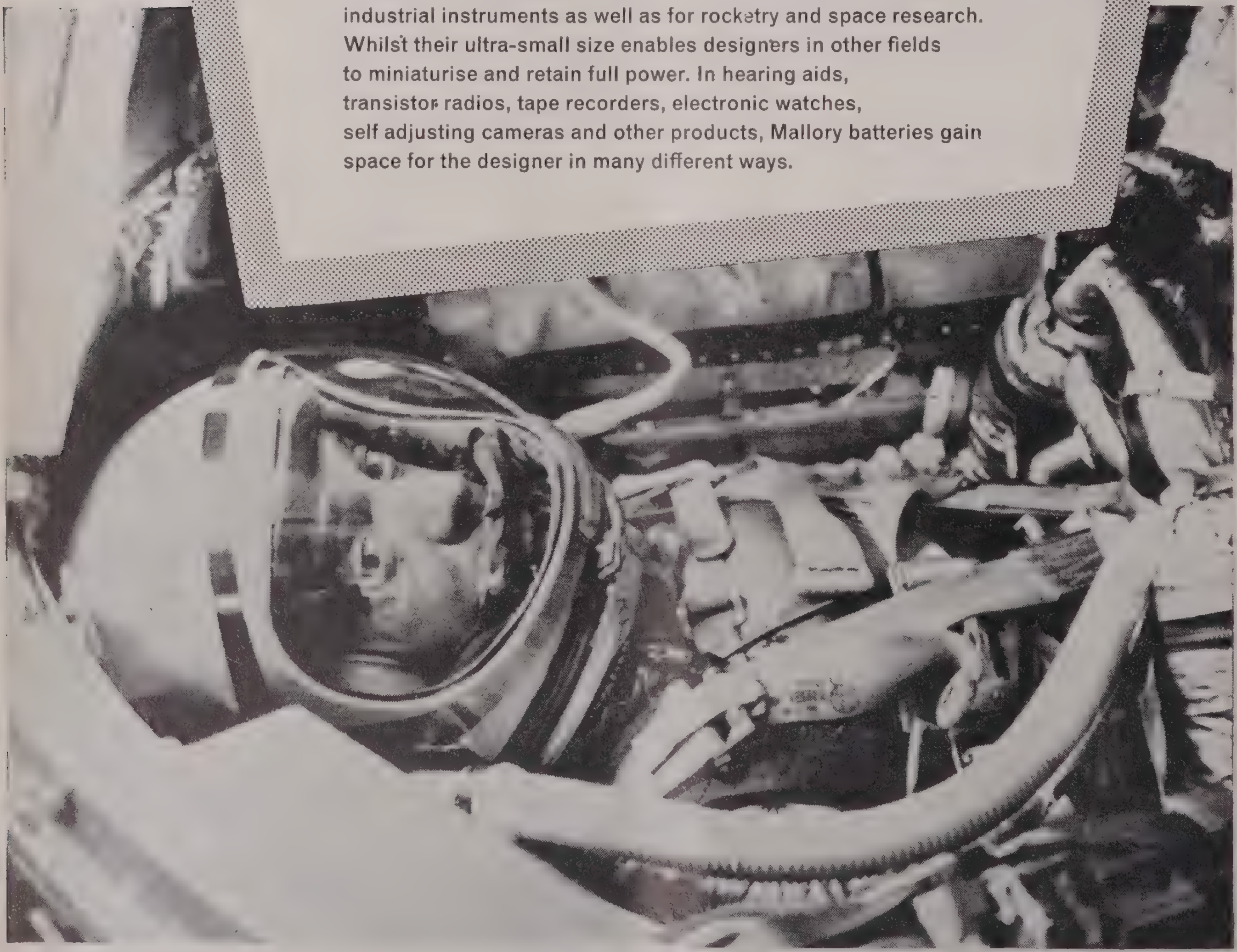

Manufacturers are advised to consult Mallory at the design stage so that the full benefit can be gained from the world's most space-saving source of power.
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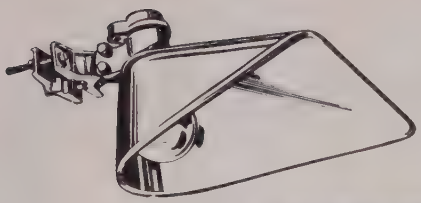
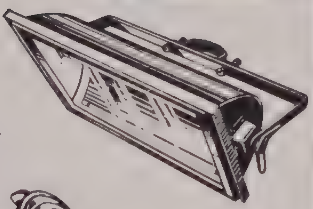
MALLORY *miniature batteries for powerful applications*

List No. 890
'Realux' Overhead Mounting model, for G.L.S. or M.A./V. lamps.



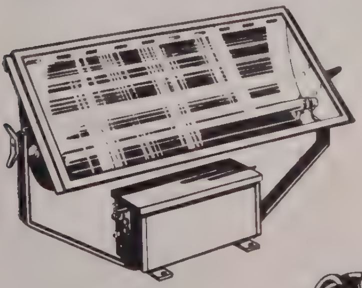
YOUR FLOODLIGHTING PROBLEM

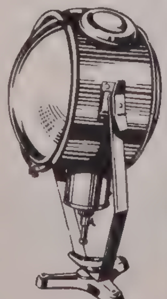
List No. 940
Downward lighting Sodium Lantern for wall or pole mounting.



List No. 775
'Festival' Lanterns for G.L.S. lamps from 100 watt to 1000 watt size.

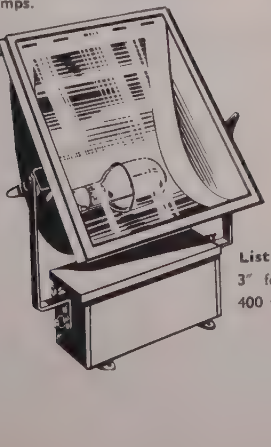
List No. 920
Telescopic Tripod for Floodlantern mounting.





List No. 942
Upward lighting Lantern for 200 watt Sodium lamp.

List No. 556
Narrow beam Projectors for 500 watt to 1,500 watt G.L.S. lamps.



List No. 1231
3″ focus Lantern for 400 watt MBF/U lamp.

Our Illuminating Engineering Department is at your service for the preparation of floodlighting schemes.

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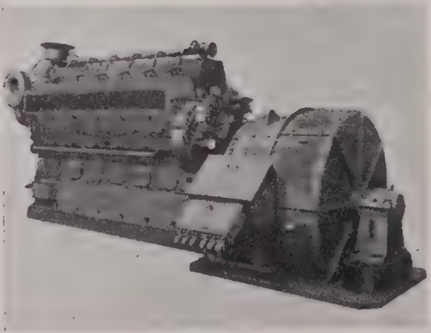
will have the answer

Possibly the most comprehensive range of any British manufacturer. Every type of lamp is catered for with either upward or downward lighting Units.

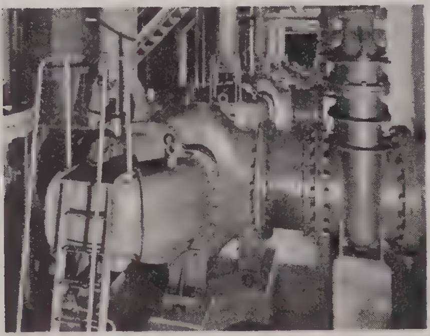
Catalogue P 6004 details the R.E.A.L. range

ROWLANDS ELECTRICAL ACCESSORIES LIMITED,
R.E.A.L. WORKS, BIRMINGHAM, 18

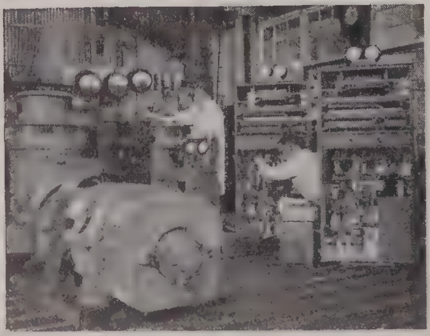
Steam Turbines



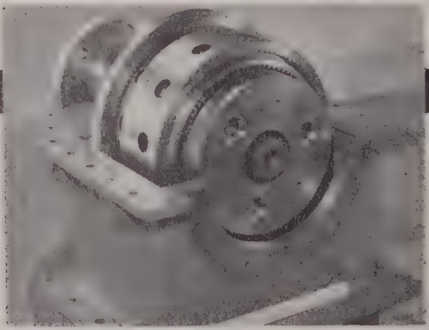
Diesel Engines



Pumps



Electrical Equipment



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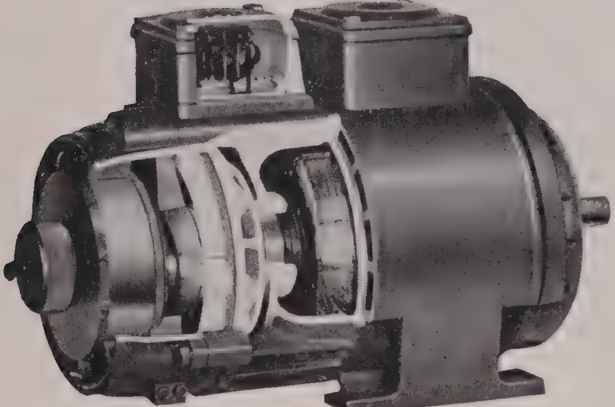
UNIQUE NEW BRAKE MOTOR from **LEROY**

F59 with constant life-long braking torque



The new "F59" brake motor from Leroy is strong and versatile.

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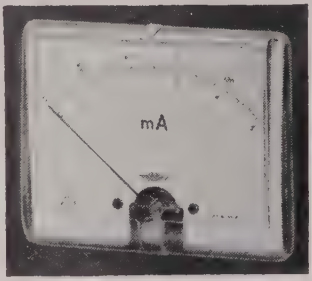

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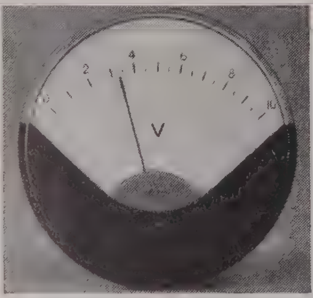

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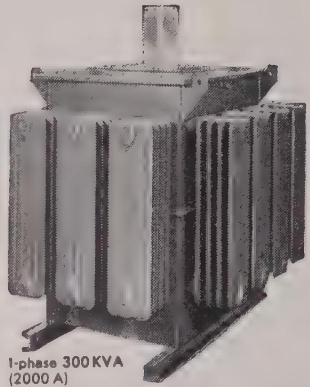

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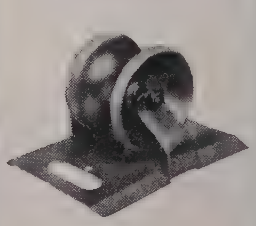

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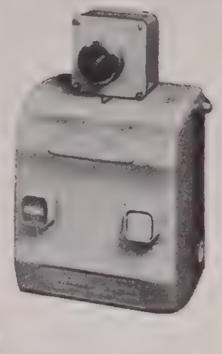

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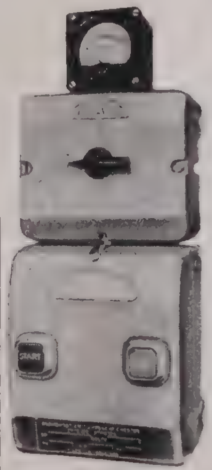

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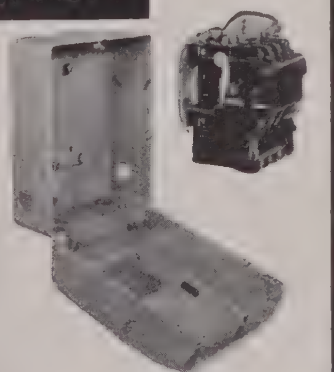
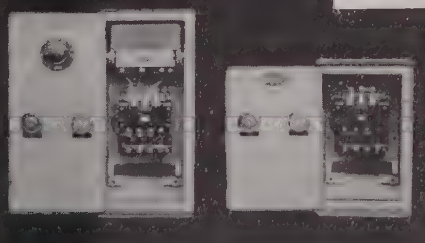


Drop-down lid gives immediate access to interior.



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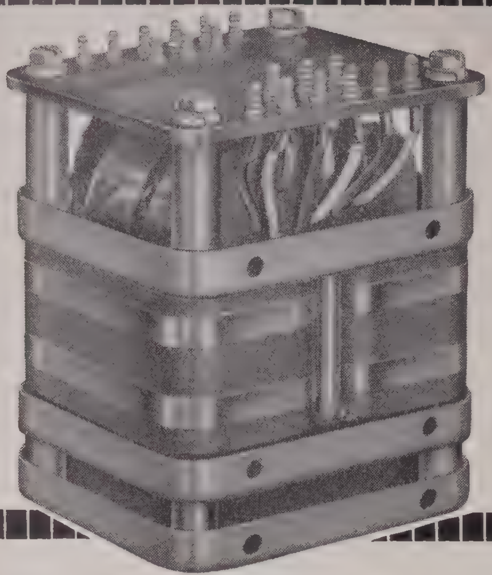

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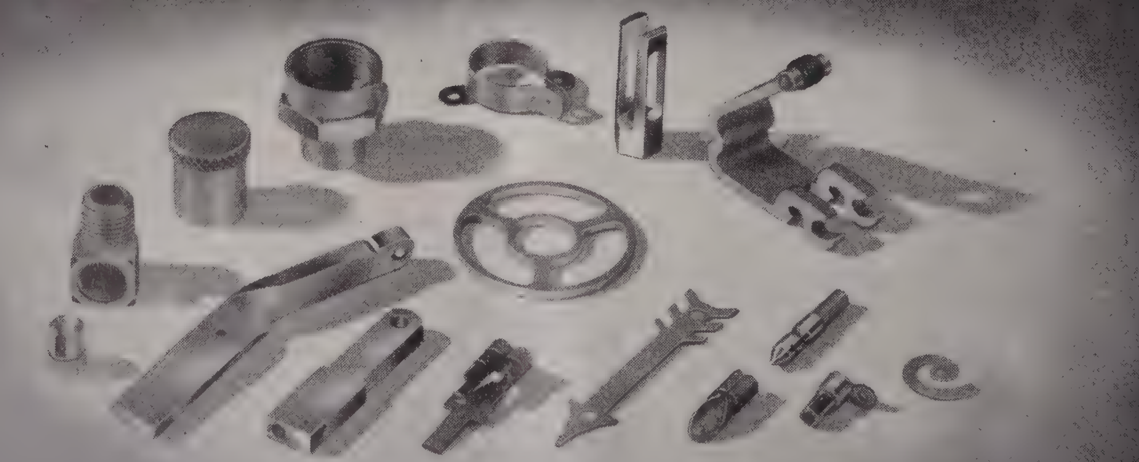

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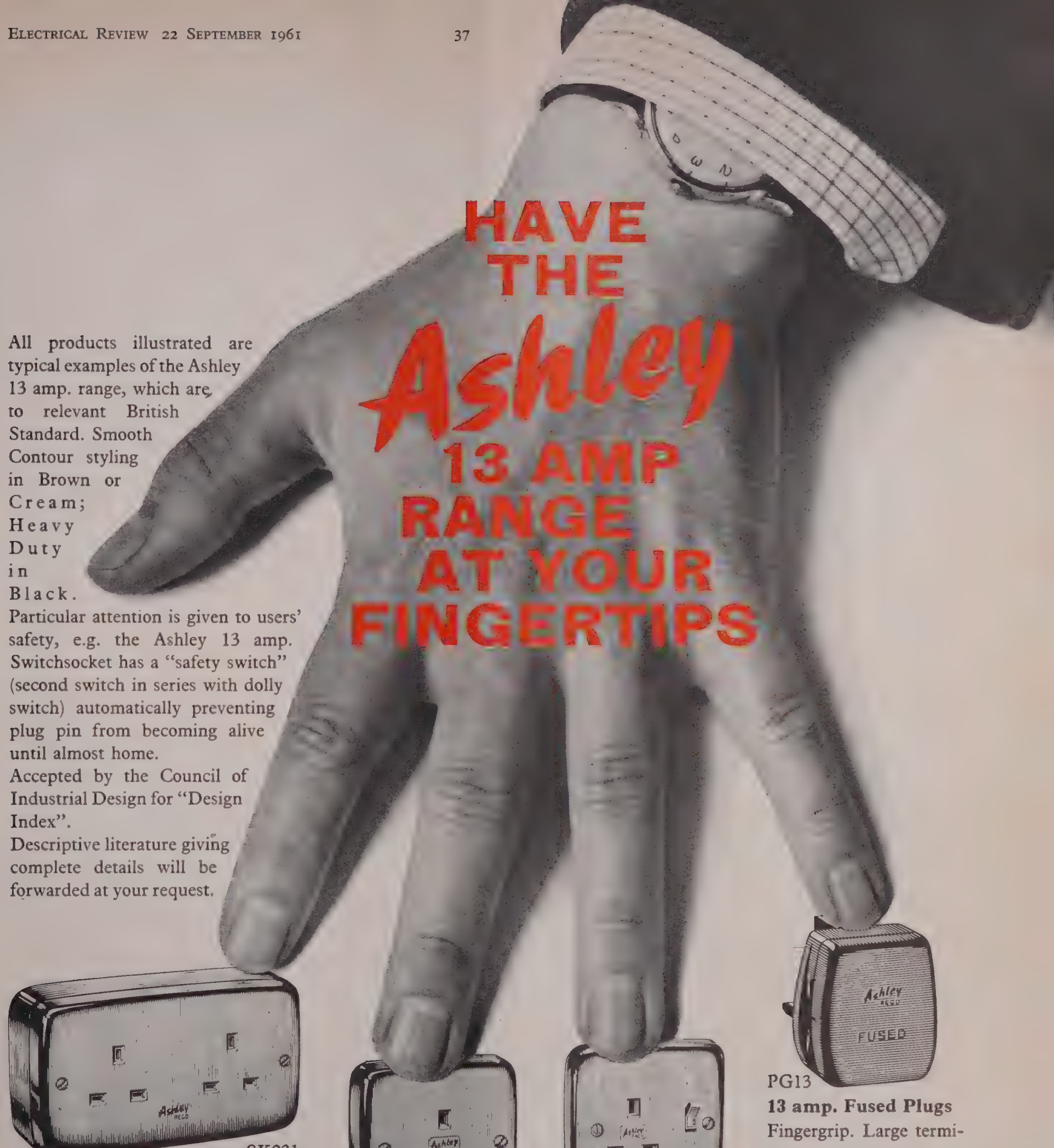

All products illustrated are typical examples of the Ashley 13 amp. range, which are to relevant British Standard. Smooth Contour styling in Brown or Cream; Heavy Duty in Black.

Particular attention is given to users' safety, e.g. the Ashley 13 amp. Switchsocket has a "safety switch" (second switch in series with dolly switch) automatically preventing plug pin from becoming alive until almost home.

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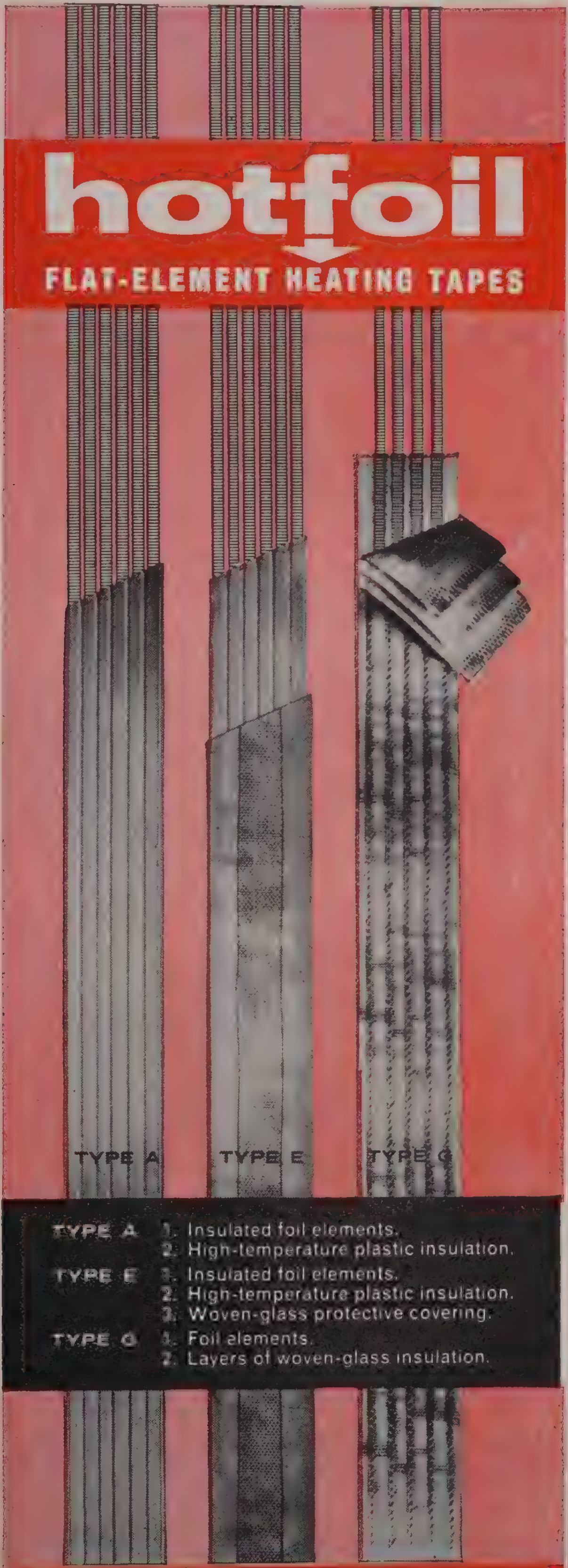

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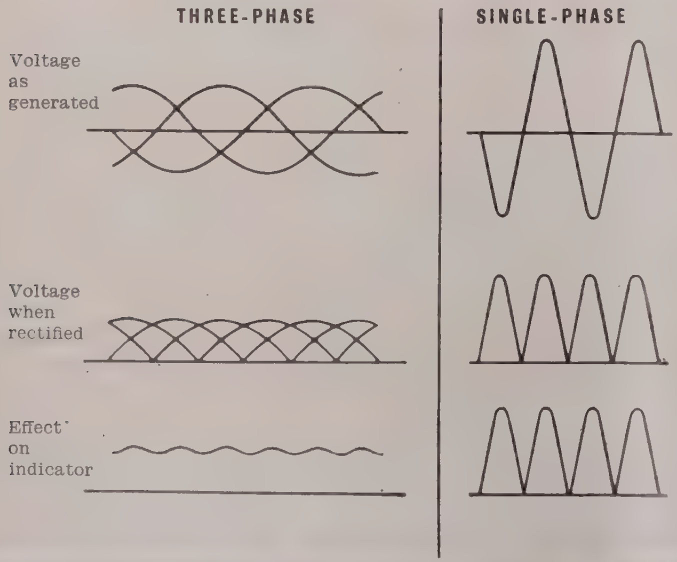

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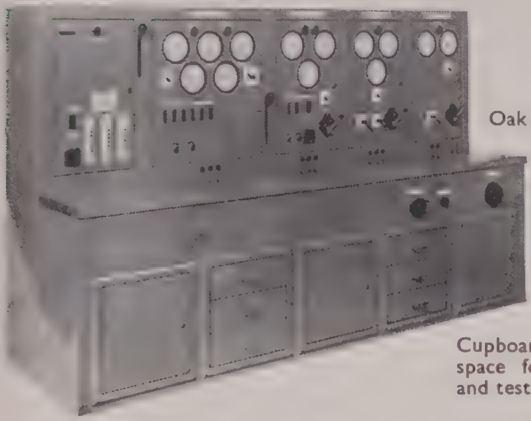

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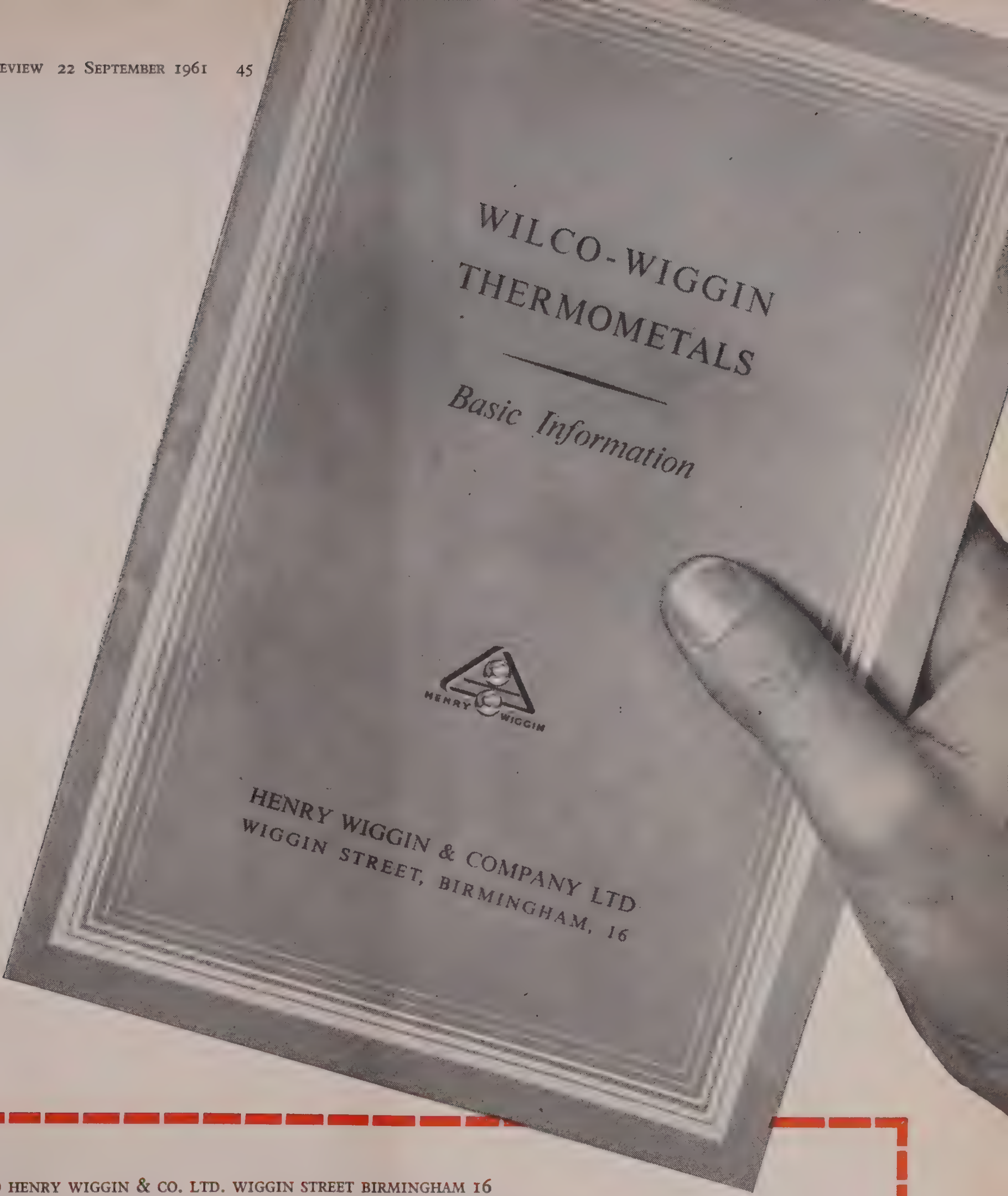

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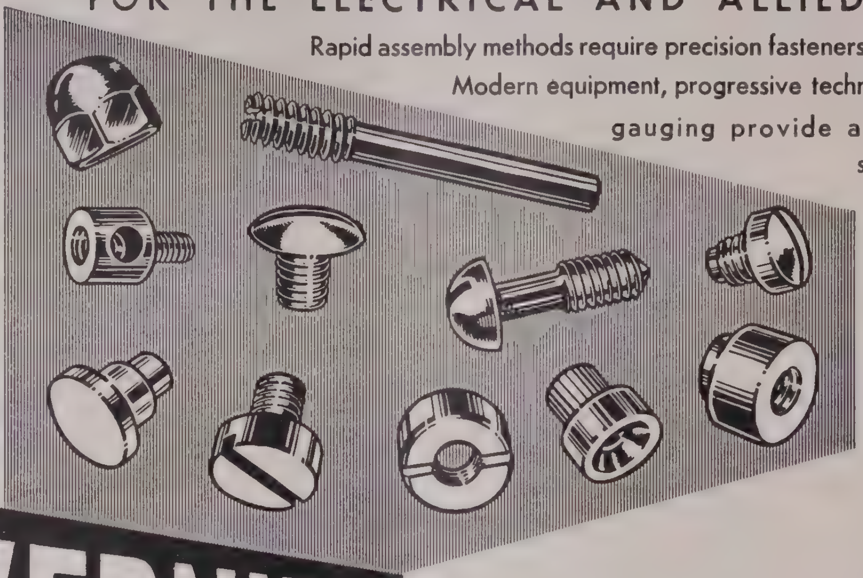

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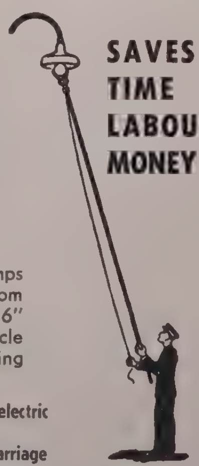

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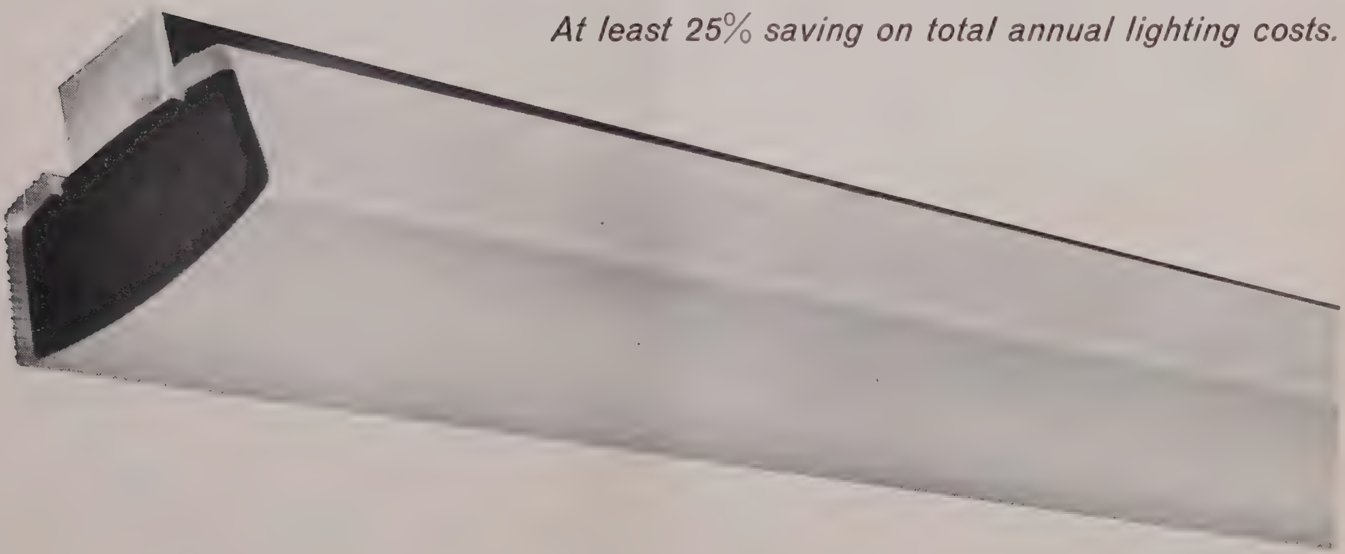

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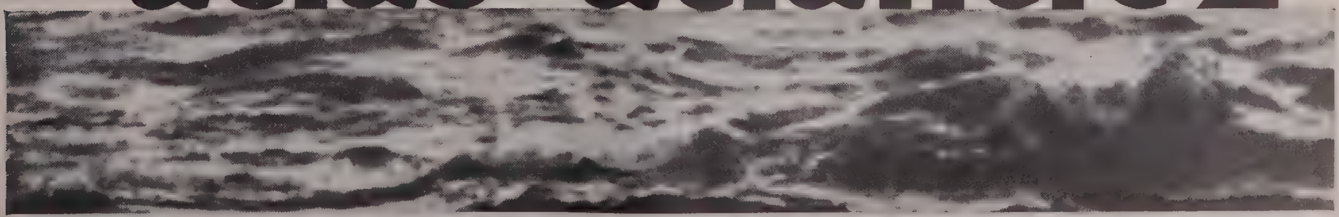

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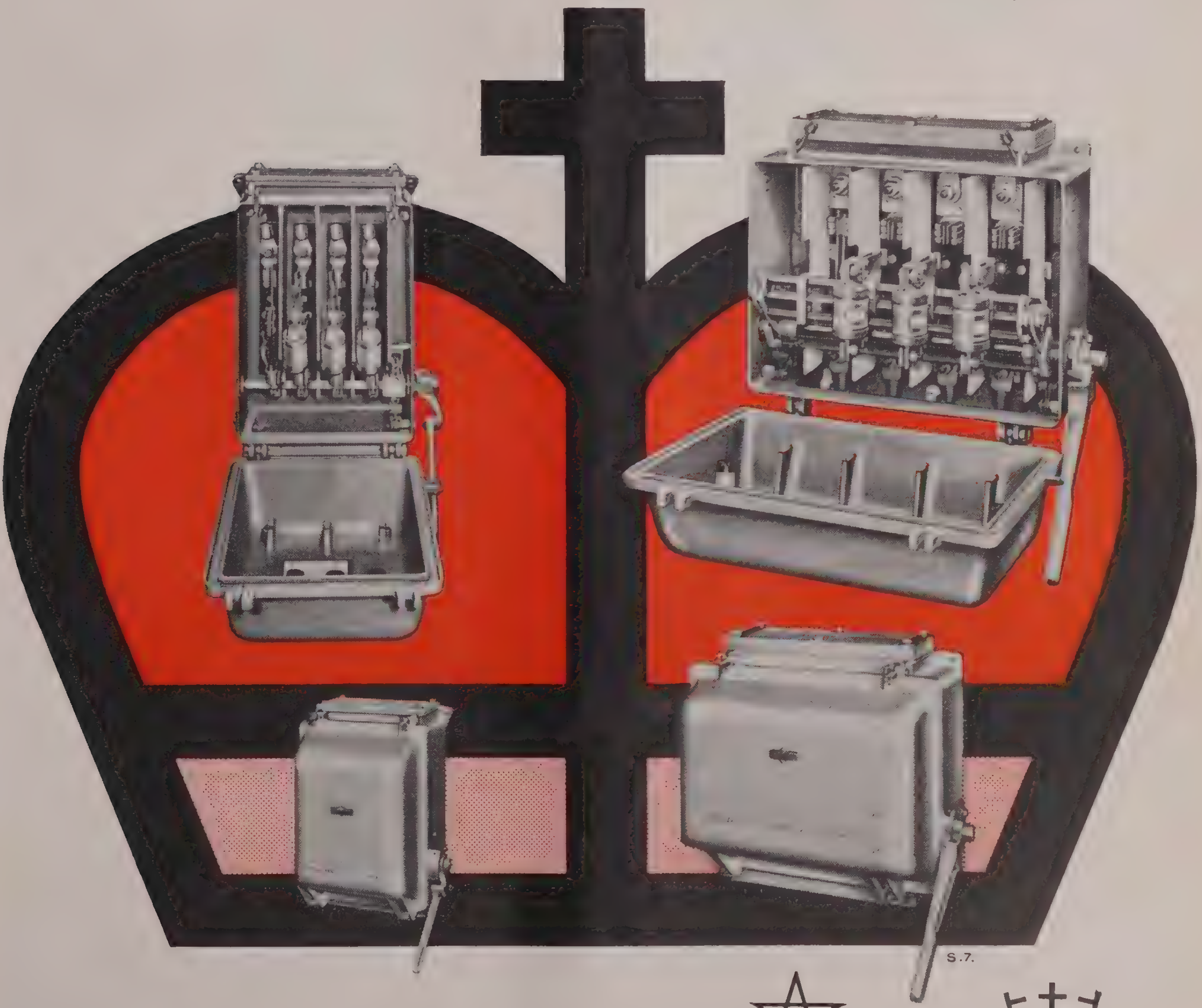

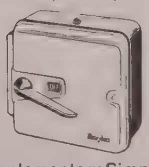

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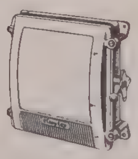

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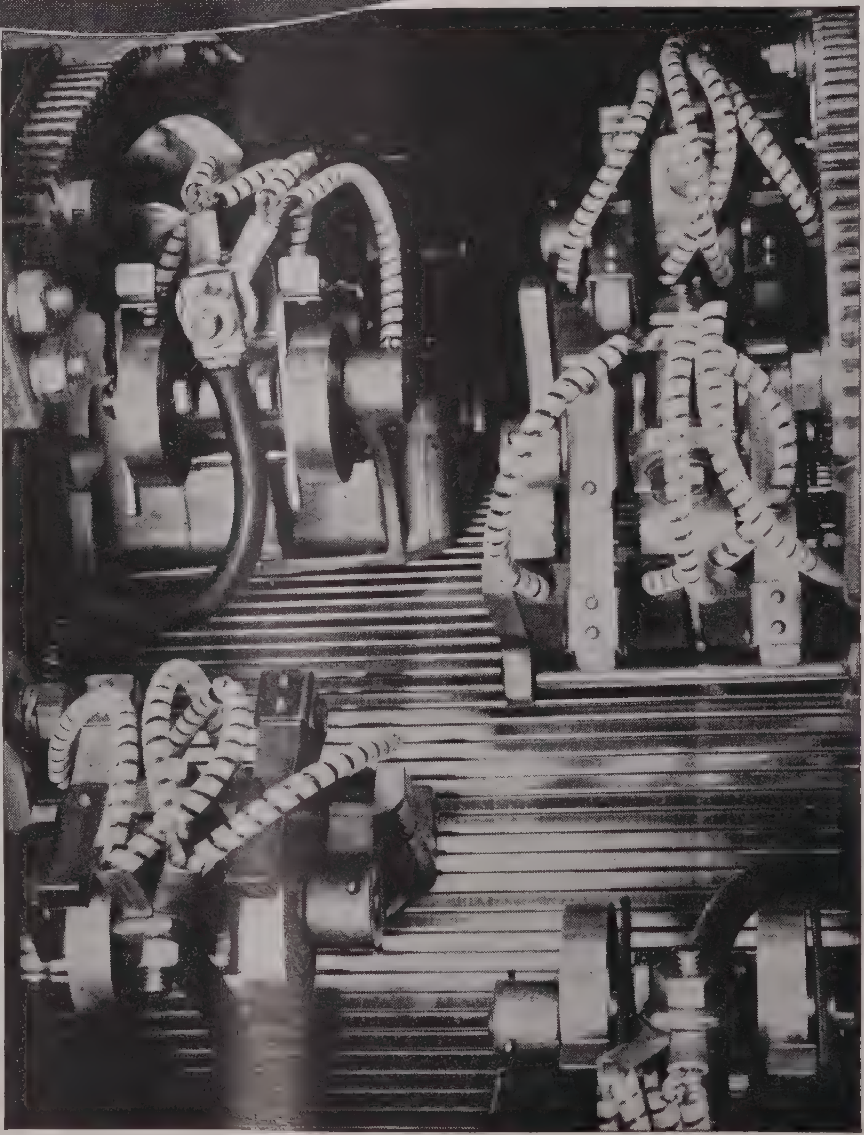

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45L40	400	58	130	1500	1.05
45L60	600	58	130	1500	1.05
45L80	800	58	130	1500	1.05
45L100	1000	58	130	1500	1.05
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25H10	100	20	55	400	1.05
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25H40	400	20	55	400	1.05
25H60	600	20	55	400	1.05
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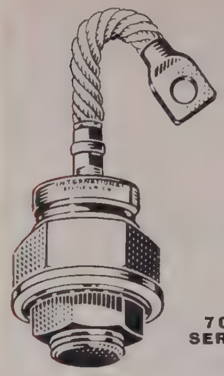

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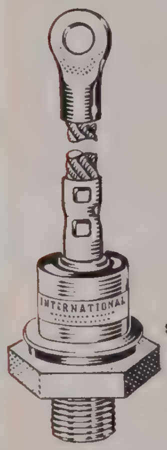

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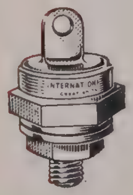

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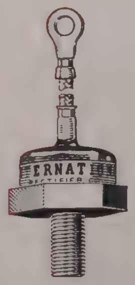
25HB20	200	20	53	300	1.05
25HB40	400	20	53	300	1.05
25HB60	600	20	53	300	1.05
25HB80	800	20	53	300	1.05
	RATING NOTES: *Maximum peak voltage which must cater for peak of crest [illegible] transients in the system §Single phase halfwave rating mounted on 3" x 3" by $\frac{1}{16}$" thi[illegible] 30°C Ambient				



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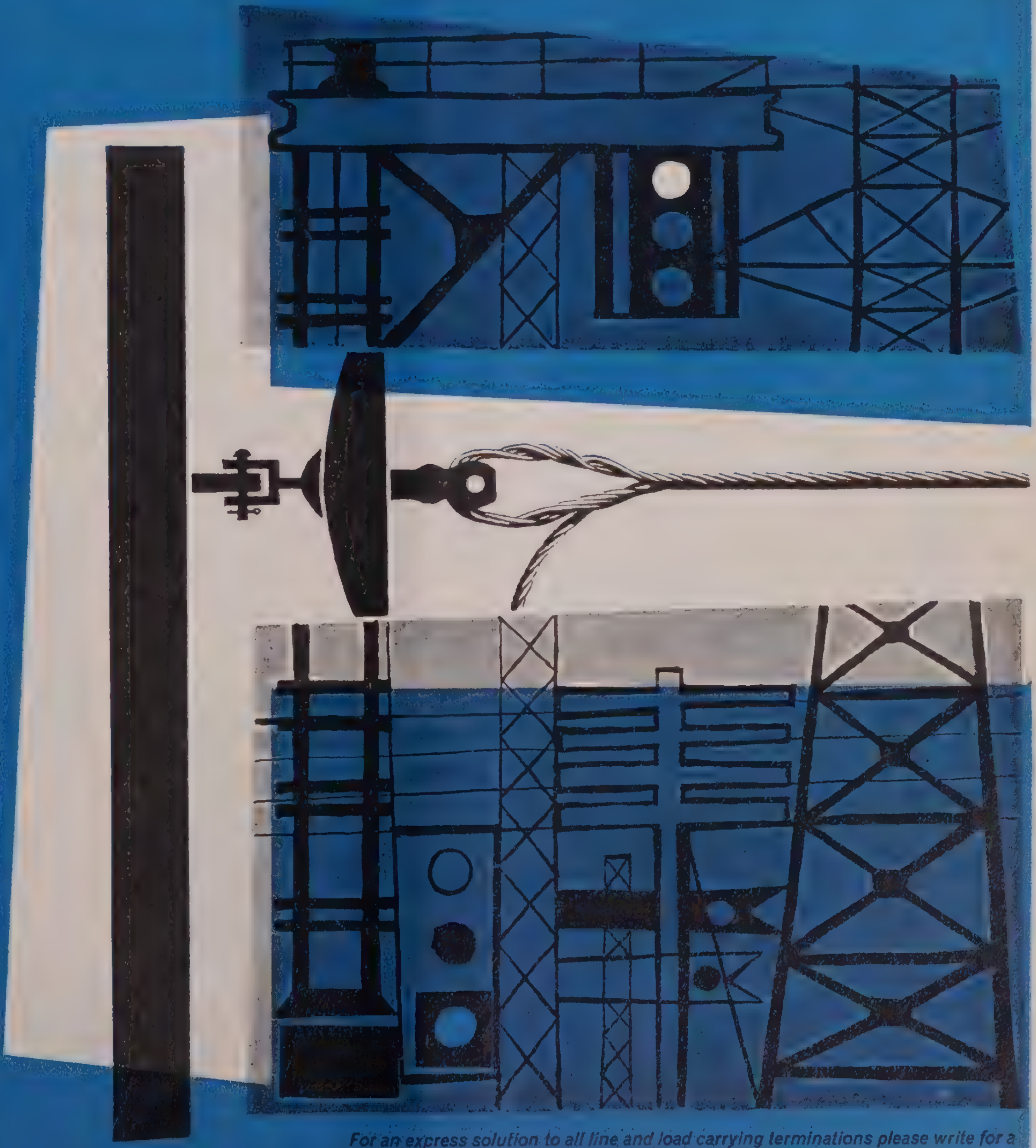

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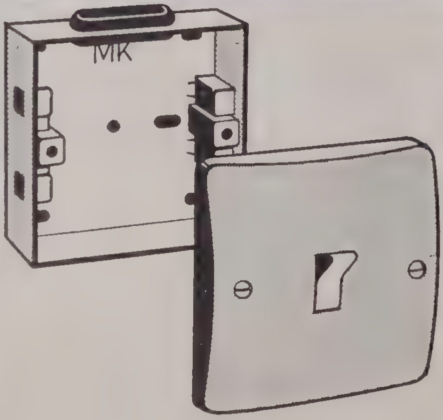

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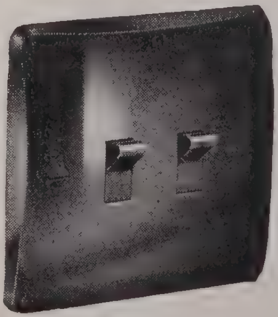

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List No. 4833
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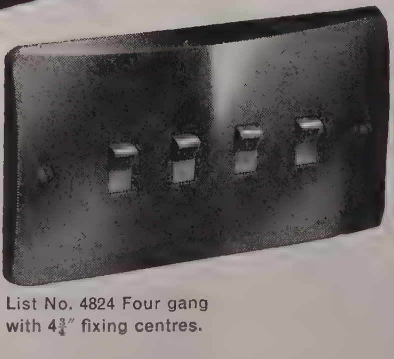

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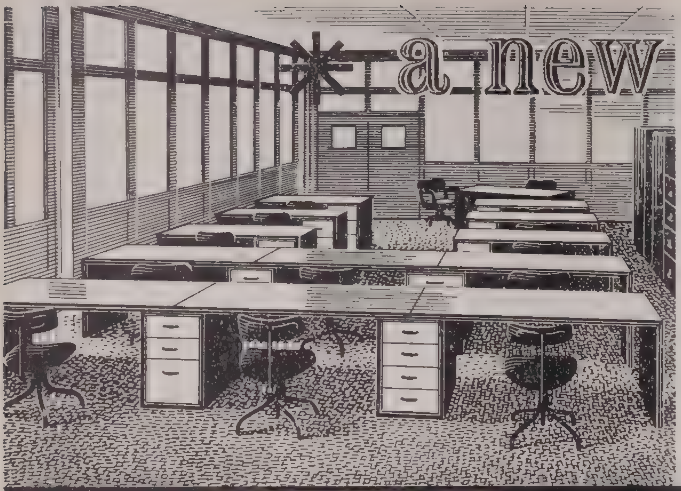

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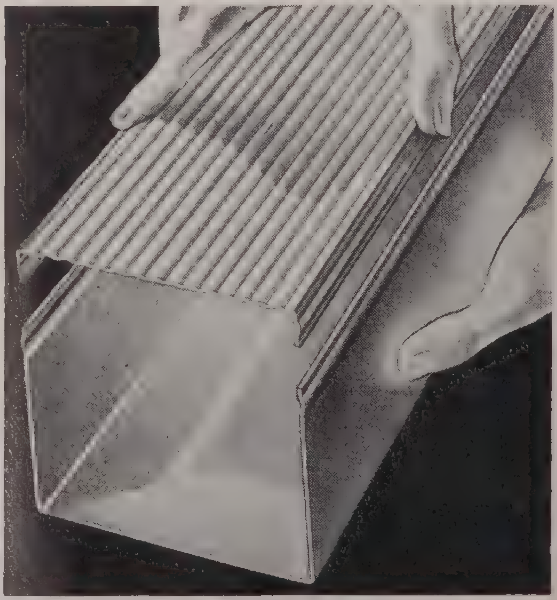

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ELECTRICAL REVIEW

22 September 1961 Vol. 169 No. 12 Established 1872

Patterns of Trade

AN important element in the success of a business is the ability to spot and exploit an opportunity for increasing sales. This applies equally to an individual company and to a whole industry. In international trade in electrical goods the strongest advance in recent years has been in exchanges between industrialised countries. This explains to some extent the rapid development of the electrical industries of West Germany, France, the Netherlands and Italy. Exports to other European countries form a more important proportion of their total electrical trade than is the case with the United Kingdom. For example, the thirteen countries of the European Economic Community and the European Free Trade Area take over 50 per cent of West Germany's electrical exports while only 17 per cent of the United Kingdom electrical industry's exports are sent to these destinations. For West Germany the surrounding European countries are becoming increasingly an extension of her home market, which strengthens her ability to compete elsewhere. Recognition by Japan of the opportunities in the United States has led to a four-fold increase in her sales there of electrical machinery and appliances and Japan is now easily the United States' largest supplier in this group.

The more sophisticated demands of the industrialised countries have also influenced the rates of growth in different sections of the European electrical industries, including this country. For various reasons, the opportunities for selling generating plant and other equipment for electricity supply to countries with their own electrical manufacturing industries are limited, and this side of the industry, which has also had to grapple with the problem of producing fewer but larger units for the home market, has advanced less rapidly than the branches producing radio and electronic apparatus. These have been stimulated by defence expenditure and the spread of television. Radio, electronic and telecommunications equipment now accounts for about 40 per cent of the British electrical industry's total output and it has shown the strongest upward trend in exports. Europe with 45 per cent of the total is the largest market.

Readers who have followed our series on " Electrical Manufacture in Europe " will recognise this as a familiar pattern in other countries, and it is emphasised again by an article on European electrical trade in the latest *E.F.T.A. Bulletin.* Now that Britain has applied to join the Common

Market the question of the division of trade between the two trading groups may be largely academic, but there is no reason to quarrel with the article's general conclusion that the future pattern of inter-European trade will depend on the competitive positions of the British and West German electrical industries in the medium and light current sections.

NATURAL ENERGY

The only permanent structure required for a tidal power scheme is a dam with the necessary openings for the units. Tunnels, penstocks and tail-races are not required. Thus, the capital saving on civil engineering works compared with a conventional hydro-electric scheme is about 40 per cent. However, the construction of such a project has had to await the development of a suitable low-head turbine.

To make the scheme economic, it must be flexible and the plant must be able to produce power when peak demand dictates, independently of the state of the tides. This means that the turbine must be capable of operation in either direction. It must also be suitable for use as a pump, in either direction, so that surplus power can produce artificial high or low tides. Such a unit, the " bulb " turbine, has passed final tests in a disused lock at St. Malo, France, and a 240 MW scheme is now under construction on the Rance River in Brittany. When it is completed in 1967 this will be the world's first major tidal power scheme.

The energy which will be used to produce electrical power from the Rance scheme will be drawn from the orbital energy of the moon and the earth's rotational energy. When the power scheme is operating the rate of the earth's rotation will be imperceptibly slowed down and the rise and fall of the tide in the English Channel will be reduced. It is comforting to know that these effects are unlikely to have any serious consequences.

E.T.U. MEMBERS' RESPONSIBILITIES

The Trades Union Congress is reluctant to interfere with the internal arrangements of its constituents unless they are considered to be detrimental to the trade union movement generally. Such was the case in the matter of the election of officials of the Electrical Trades Union. The recent legal action which arose from this received a great deal of attention from the press and it was implied by some papers that what happened in one union might go on in others. That was why the General Council of the T.U.C. stepped in and finally secured the expulsion of the E.T.U.

Now that the E.T.U. is no longer affiliated to the T.U.C. the General Council is free to take much more active steps to protect the trade union movement from any further happenings which would subject it to obloquy. Mr. George Woodcock, the general secretary of the T.U.C., has written to all E.T.U. branch secretaries pointing out that if the Union's affairs continue under the control of an executive council constituted as it is at present it is unlikely that the E.T.U. will be re-admitted to the T.U.C. He has urged the membership of the union to have proper regard for their responsibilities in this direction. In other words they should be sure, in the election now taking place, to record their votes—and in the right direction.

As a postscript, it may be mentioned that Mr. Frank Haxell, the former general secretary of the E.T.U., told a large gathering of union members last week that he was prepared to stand again for the position of general secretary in the elections.

COOKER BUSINESS

Having regard to the state of the domestic appliance market generally during the past year, the makers of electric cookers have been fortunate in maintaining their position so well. This can be attributed to their active selling methods and to their anxiety to meet the requirements of their customers—and, of course, to their education of the public to accept improved designs.

As will be seen from some notes on the subject on page 485 of this issue, production in the first half of this year was very slightly higher than in the corresponding period of 1960. While the Electricity Boards naturally remained the principal suppliers of cookers, their proportion was slightly lower and that of wholesalers and " private " retailers up to a corresponding extent. The small proportion exported was much reduced.

It is a measure of the need for rapid adaptability on the part of manufacturers that in twelve months there were very considerable changes in the public's preferences. For instance, two-plate cookers which accounted for 28·4 per cent of the sales in June, 1960, represented only 1·4 per cent in June this year. Conversely, cookers with four or more boiling plates jumped in percentage from 4·03 to 43. The scope for further business is apparent when it is known that still only 30 per cent of United Kingdom households own electric cookers, a lower proportion than in the United States and West Germany—and even in Japan.

" COAL BY WIRE "

There is still a common misconception that coal and electricity are rival fuels. The South of Scotland Electricity Board, which is achieving considerable success in the promotion of all-electric dwellings, felt it desirable to remove any chance of misunderstanding among the large number of miners in its area, and with the co-operation of the Scottish Division of the National Coal Board an effective series of advertisements has been prepared with the theme of " Electricity is Coal by Wire." These emphasise that all-electric houses simply use coal in a more efficient manner via the generating station. It is pointed out that the Board is in fact the coal industry's best customer in Scotland; by 1970 it is expected to use about a third of the total output of Scottish pits.

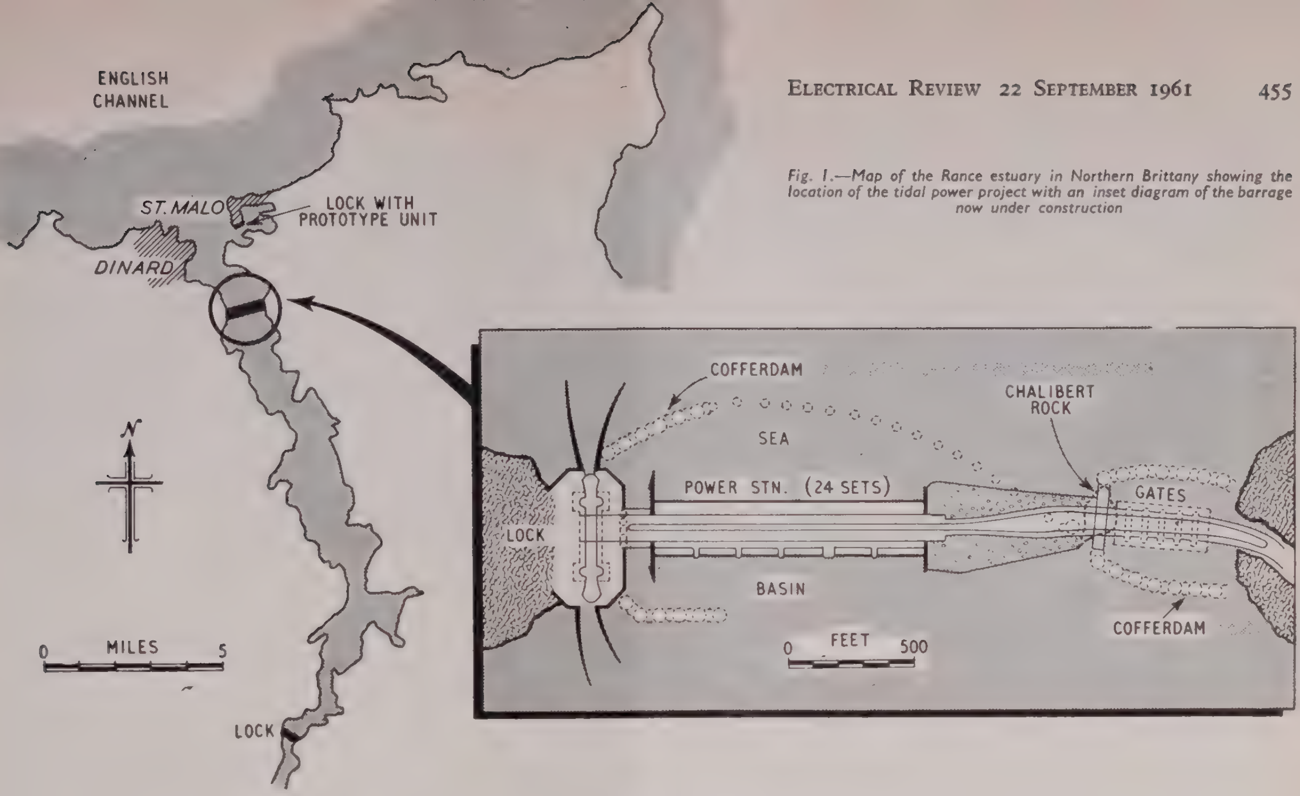


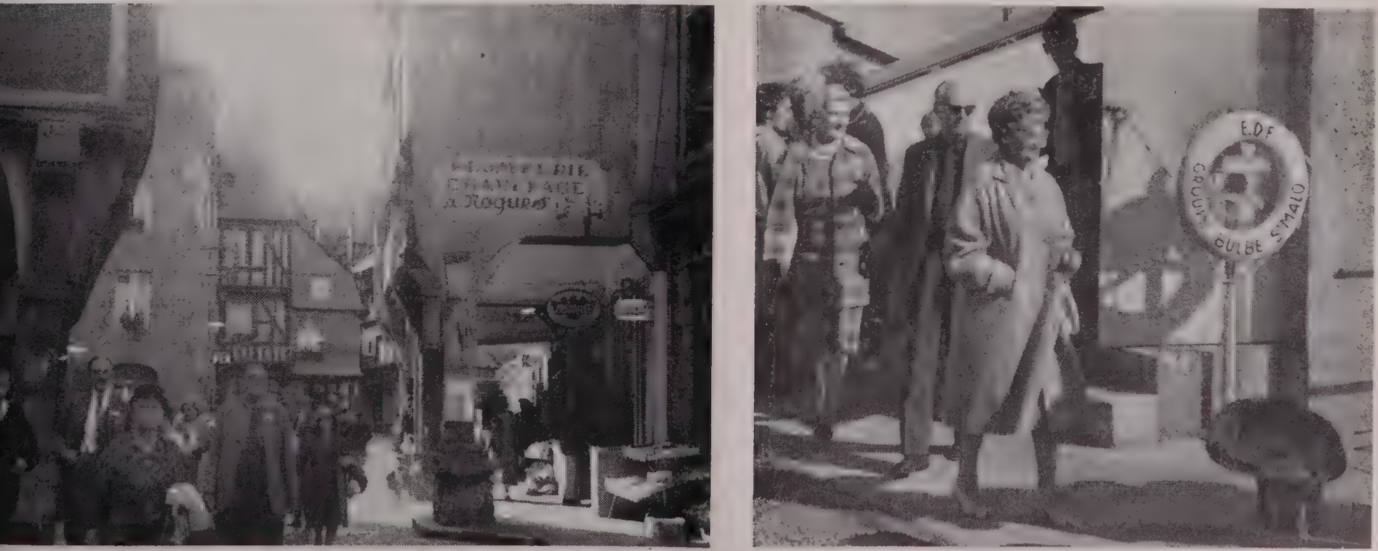
Fig. 1.—Map of the Rance estuary in Northern Brittany showing the location of the tidal power project with an inset diagram of the barrage now under construction

LA RANCE

The world's first tidal power barrage is now under construction on the Rance estuary in Brittany. When completed in 1967, it will contain twenty-four 10 MW units, each of them capable of turbine/generator or pump/motor operation in either direction. Present progress was seen by delegates attending the recent I.E.E. Supply Section summer meeting in Northern France

Some 70 members with their wives attended the summer visit of the Supply Section of the Institution of Electrical Engineers to Dinard, Northern France, a fortnight ago. One of the prime objects of the visit, which took place in glorious weather amid beautiful countryside and historic towns, was to see the progress made by Electricité de France in its ambitious 240 MW tidal power project on the Rance River estuary (Fig. 1).

The simplest form of a tidal power scheme consists of a dam across an estuary enclosing a basin which is filled on the rising tide by opening gates in the wall of the dam. The basin is then emptied through the turbines when the



A group of delegates in Dinard and (right) a few of the delegates at the research station at the disused lock at St. Malo

The disused lock at St. Malo in which the prototype 9 MW unit has been installed

ebb has created an adequate head. With this system, the quantity of power generated and the times of the generating periods depend on the tides. However, by employing reversible turbines which can also act as pumps, a flexible power plant is possible. Power can be generated when the basin is emptied on the ebb and when it is filled on the rising tide. These operations can be augmented by using off-peak power to pump in either direction. Another form of regulation of the energy available is by spilling water in either direction. Thus, an economic and flexible tidal power scheme depends mainly on the development of a suitable reversible low-head turbine/pump. The French electrical industry has been developing such machines for some years and now leads the rest of the world in this field. These developments were described in an article entitled "Tubular Turbines" in the *Electrical Review* of 12th June, 1959.

St. Malo Unit

A prototype of the units to be employed in the La Rance tidal power project was installed in a disused lock at St. Malo at the end of 1959. This 9 MW unit was mentioned in the article referred to in the last paragraph and full technical details of "bulb" (or "tubular" or "axial") turbines can also be obtained from the same source. Briefly, however, the bulb unit consists of a combined turbine-generator housed within a streamlined bulb shell. This casing "floats" in the centre of a large diameter horizontal pipe or duct through which the water flows. The fixed guide vanes serve as supports and a shaft from the machine room gives access to the inside of the shell. The St. Malo unit has a 19ft diameter runner with adjustable blades. Adjustable guide vanes are also provided. The unit was designed and manufactured by Etablissements Neyrpic, of Grenoble, and the alternator was made by Société Alsthom, of Paris. The cross-section through the Rance power station (Fig. 2) shows the typical arrangement of a bulb unit.

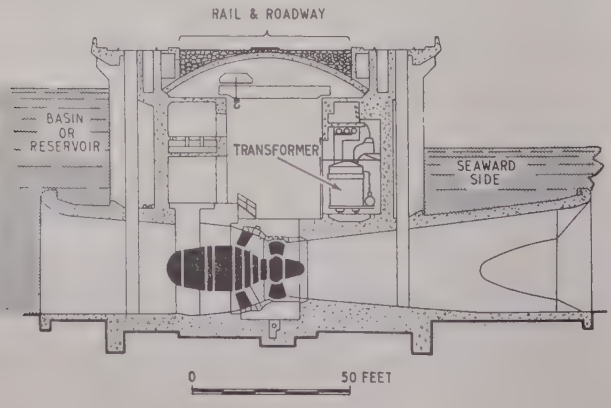
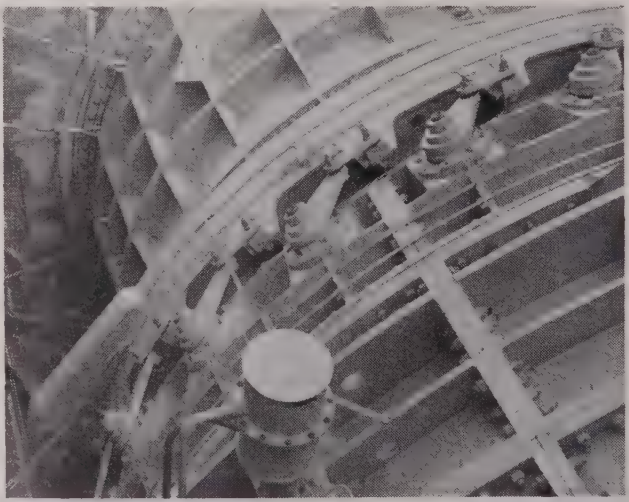


Fig. 2.—Cross-section of the Rance power station

During the visit to St. Malo we inspected the prototype machine in the disused lock and were also shown the large-scale model of the Rance River system which is now being used to investigate various hydraulic problems connected with navigation on the river. Tides are reproduced in the model on an appropriate scale. On the following day the party saw some of the work in progress on the construction of the actual 240 MW Rance project.



The prototype unit at St. Malo

The Rance tidal power station will be situated between Briantais Point on the east bank and Brebis Point on the west bank of the Rance River. At this point, the Rance is about 2,460ft wide. The storage reservoir extends as far back as the lock near Dinan, some 12 miles, and it has a surface area of about 8·5 square miles. At high tide, about 47,700 million gallons will be stored in the basin, the tidal range being about 45ft. Construction of the barrage commenced about a year ago and completion is scheduled for 1967; the first set will be commissioned about the end of 1965. When completed, the net annual

Construction of the Rance barrage. Photographs taken at high tide

Top: General view of the site from the seaward side

Centre: The east bank showing the cofferdam around the gate area

Right: Work in progress on the lock system at the west bank end. The west tower of the Blondin cable system can be seen on the right

output will be 545 million kWh. The capital cost of the scheme is estimated at £30 million.

Power Station

Starting from the west bank, the barrage consists of a 215ft long, 42ft wide lock; the power station; and a 380ft long gate section comprising six 50ft wide, 30ft high fixed roller gates (Fig. 1). The power station will consist of a hollow concrete dyke, reinforced on both sides by buttresses, 45ft apart. The roof will be formed by an arch which will set up thrusts in the opposite direction to that of the flow. The length of the station will be about 1,280ft with a total width of 174ft and it will contain 24 bulb sets of 10 MW capacity each and three 5·6/225 kV 80 MVA transformers. Each turbine will have four runner blades giving a wheel diameter of 17·6ft. The generator will be directly coupled to the turbine and will operate at 94 r.p.m. It will rotate in air at a pressure of 28·5 p.s.i.a.

The transformers will be situated in special large bays on the north side of the station and each transformer will be fed by two banks of four bulb units each. The transformers will be connected to the substation on the west bank by 225 kV oil-insulated cables. Access to the power station will be by a shaft situated on the west bank of the river and a passage under the lock.

Construction

The final structures will be erected in dry conditions inside three enclosures formed by cofferdams. During the first stage of construction, one cofferdam will cover the work on the lock at the west bank. This enclosure, which is nearly completed, consists of concrete walls which will be incorporated in the final structure. The other first stage cofferdam, which is also nearly constructed, will be used to allow building of the gate system near the east bank. This enclosure consists of 50ft diameter flat web sheet-piling gabions filled with sand.

Following the completion of the lock and gate system, the main north cofferdam will be completed around the power station area. This cofferdam consists of 30ft diameter caissons spaced at 70ft centres. The space between the caissons will be filled with 75ft diameter flat web sheet-piling gabions filled with sand. When this cofferdam has been completed, the gates will be closed and the water level in the estuary will be maintained at a sufficient level to allow navigation on the Rance. The south cofferdam will then be finished in still water. Sand is being obtained from the river bed.

Following the visit to the dam on Friday, 8th September, a dinner-dance was held at the Casino, Dinard. Mr. J. E. L. Robinson, chairman of the Supply Section, proposed toasts to the President of the Republic and the Queen. He thanked M. Maubaussin, director of the project, for allowing the party to inspect the scheme. Mr. Robinson thought that because of the proposed changes in the organisation of the Institution's Sections the present visit would probably be the last but one which would be held by the Supply Section.

MINIATURE CIRCUIT-BREAKERS

THE protection of circuits by miniature circuit-breakers is the subject of the Electrical Research Association's report Ref. F/T197. These breakers have an inverse current/time characteristic, i.e. a reduced tripping time as the current is increased. The minimum tripping current is usually set at about 25 per cent over-current. There is, however, a minimum tripping time for a given m.c.b., which is substantially independent of the current. The tests carried out showed that this seems to be not less than 10 msec, corresponding to about one half cycle. For a given temperature rise, the time that a current may be permitted to flow in a cable under conditions of large over-current should be inversely proportional to the square of the current. When the minimum tripping time is reached the cable heating will become proportional to the square of the current. This could, in some cases, impose a limit to the fault current that may be associated with a given combination of m.c.b. and cable, which might be smaller than the maximum fault current that the m.c.b. could otherwise handle. This is especially so for the smaller ratings if the m.c.b. has a low impedance.

This report is not concerned with the design or the breaking capacity of m.c.b.'s, which may be greater than the maximum current of 1,500 A used in these tests. It is concerned primarily with thermal effects in the protected cable during the operation of the m.c.b. in a 250 V (nominal) circuit with currents up to 1,500 A at 0·8 p.f. These values of current and power factor were chosen because they had been tentatively agreed by a C.E.E. committee and there was no British Standard or draft standard then available to serve as a guide.

The tests demonstrated that with the current limited to 1,500 A at 0·8 p.f. no instance occurred in which a cable was fused when protected by a m.c.b. of the same rating. The risk of damage to a cable when subjected to a given prospective current flowing for a given time increases as the cross-sectional area of the cable is reduced. This would imply that the lowest rated, 2 A, flexible cable tested is the one most likely to suffer damage; it did not do so, however, because the impedance of all the 2½ A m.c.b.'s tested was high, ranging from 0·32 to 0·94 Ω and this restricted the ampere^2 sec liberated in the cable.

It is permissible, according to the I.E.E. Wiring Regulations (Regulation 108), for a 14/·0076in (i.e. 2 A rating) flexible cable in a pendant to be protected by a 5 A fuse. If the fuse were replaced by a 5 A m.c.b. of the type tested, such a combination could cause fusion of the cable in situations where a prospective current in excess of about 1,000 A could be attained. A 23/·0076in flexible cable would not be fused with prospective currents up to 1,500 A.

The maximum ampere^2 sec passed by a m.c.b. does not necessarily occur with a symmetrical current. This may be of some significance in drafting test clauses, especially if lower power factors than 0·8 are considered.

The full report—" The Protection of Circuits by Miniature Circuit-Breakers," by H. W. Baxter, B.Sc., M.I.E.E.—is obtainable from the Electrical Research Association, Cleeve Road, Leatherhead, price 10s 6d, postage 6d.

Nuclear Fusion Research

A CONFERENCE on plasma physics and controlled nuclear fusion research, organised by the International Atomic Energy Agency, was opened in Salzburg on 4th September.

This first international scientific meeting devoted entirely to work in the field of plasma physics undertaken specifically for the achievement of controlled thermonuclear fusion is being attended by over 500 scientists from 28 countries and from seven international organisations. The results obtained by 476 research workers have been submitted for discussion. The national delegations from the countries leading in this field include almost all the scientists who have played a decisive part in the development of plasma physics and controlled nuclear fusion.

Recalling that it was three years almost to the day when at the second Geneva Conference on the Peaceful Uses of Atomic Energy in 1958, the veil of secrecy was first withdrawn from the results of controlled nuclear fusion research, Mr. S. Cole, director-general of the A.E.A., stated that great accomplishments had been made during the intervening years. " It has become more and more evident," Mr. Cole said, " that a better understanding of the basic phenomena underlying controlled nuclear fusion is needed before the goal of controlled fusion may be reached. Consequently, the work undertaken in recent years has been characterised by much basic research on the behaviour of plasmas. The fact that such research is most complex and also very costly enhances the desirability of co-operation and free exchange of information, knowledge and experience between the different national and international research laboratories."

VIEWS on the NEWS

By "REFLECTOR"

THERE is nobody whose views on trade unionism are likely to be more informed, or sounder, than Lord Citrine who devoted a great many years of his life to the movement, starting, of course, with the Electrical Trades Union. Moreover, he has had a long period as a " boss," including a decade as head of the nationalised electricity supply industry. Consequently his ideas on the present labour situation and the future of trade unions are worth having: they were recently set out in an interview with Kenneth Harris reproduced in the *Observer*. Among the many points with which Lord Citrine dealt were the apathy of trade unionists in the election of their officials, the position and functions of shop stewards (who are often misjudged), and the nature of the leadership. He thought that trade union leaders should be better paid and better trained, and that there should be more of them. He visualised the endowment of the unions with more power in the country's industrial, commercial and economic affairs, bringing with it a greater responsibility for the actions of their members.

* * *

I learn that Mr. P. A. Thorogood, the very active general manager of the Electrical Engineers Exhibition, has had to shelve, for the second time, his project of a national domestic electrical exhibition. His first proposal was to arrange a display at the Alexandra Palace, in North London. At that time the *Electrical Review* considered that, quite apart from the difficulty of attracting the public to such an exhibition without expensive " side-shows " for which the exhibitors would have to pay, it was out of the question to expect people to travel so far out. In his later venture Mr. Thorogood set out to overcome the second objection by securing a tentative option on Olympia for an exhibition, or fair, next August. But this was evidently not enough to persuade appliance manufacturers, or others likely to be interested, to support the fair. About 9,000 circulars were sent out but only 500 people bothered to reply and of these no more than 17 were in favour. It seems that the general opinion is that while a comprehensive national public electrical exhibition is a possibility a purely sectional display is unlikely to succeed. This sort of thing is constantly being done locally, which is a much more effective way of selling appliances—and electricity.

* * *

Disconnection of individual consumers for the non-payment of accounts is fairly common in this country but I cannot recall an instance of the disconnection of a town for the same reason. It has happened in the United States where the Pennsylvania Power & Light Co. has cut off the street lighting of the town of Girardville and has told the Council that it will stay off until the company's bill for $9,676 is paid, plus the cost of disconnecting and reconnecting. The President of the Council is reported by the *Electrical World* to have said that " he didn't know where the town would get that kind of money."

* * *

Animals such as squirrels which venture on to power lines usually pay for their temerity with their lives as well as causing a breakdown in the electricity supply. A cat which decided to investigate the top of an electricity pole at Halling in Kent, however, was luckier—or more cautious. According to the *Kentish Express*

> " Having expertly clawed its way up the wooden pole, the cat daintily stepped on to the live cable and perched there, apparently afraid to make the return trip. It performed its solo high wire act for some hours, but fortunately for itself and about 50 people living near by, it did not attempt to get a better balance by hanging on to one of the neighbouring cables as well."

Eventually Electricity Board engineers arrived with a hydraulic tower and rescued the cat, none the worse for its exploit.

* * *

Col. R. E. B. Crompton was president of the Engineering Section of the British Association in 1901 and in his address (reported in the *Electrical Review* of 20th September, 1901) dealt at some length with traction. With a wan smile I quote a passage from this address:—

> " The increased road and street traffic, and the development of new means of road locomotion, have made imperative some modification of our existing system of roadway administration. Cycles, motor cars, electrical tramcars, have been invented and put on roads which are maintained and worked exactly as they were 70 years ago at the commencement of the railway era, when the population of the United Kingdom was half its present figure, and that of the large towns one-tenth of the present figure. Parliament must take in hand an improved administration of our highways by a comprehensive scheme. Far too many ancient main lines of thoroughfare, already too narrow for the traffic which is on them, are being blocked by having tramways laid on them; these cause the development of building estates, which throw additional traffic on to these thoroughfares. An increase in the speed of the street traffic is desirable; for the faster the vehicles travel the less the street is occupied by them. Motor cars can safely travel at 16 miles an hour, and, therefore, need only take half the time and occupy only half the street surface that an omnibus does when travelling at eight miles per hour."

Meter Calibration and

By H. J. LOVEGROVE and G. E. PARKIN, A.M.I.E.E.*

In recent years there has been a growing demand for improving the accuracy band of watthour meters to ensure that they fulfil the requirements for certification of the Electricity Supply (Meters) Act. This demand has resulted in increased vigilance by meter manufacturers to see that their products meet these conditions on arrival at the Electricity Boards' testing stations. This article describes a new method developed and employed at the Enfield factory of Sangamo Weston, Ltd., for single-phase watthour meters. The production of these meters was described in last week's issue

ECONOMIC considerations necessitate some form of multiple testing of large numbers of meters against standards of known and maintained accuracy, but this must be done without prejudicing the degree of accuracy of any individual meter under test. Moreover, it is essential to ensure consistency of meter performance, and that no meter has variable errors. Where " spot " methods are used for comparing the meter disc revolutions against a rotational sub-standard meter, errors may be introduced due to starting and stopping of the test run, creepage of discs in the meters during recording of readings, misinterpretation of disc markings, and disturbance of the meter bearings when the disc indices are being set, which can have considerable effects on light load accuracies.

Some testing stations overcome these difficulties by subjecting meters to long-period registration tests at all loads, so that "spot" test errors are eliminated, and correctness of the register gearing is checked. This method of test takes several days to complete and is unsuitable for calibration procedure.

To combat the undesirable features of " spot " testing, but at the same time provide the rapid method of testing required for calibration purposes, a new meter test technique has been evolved, incorporating a printed record device which gives continuous visual indication of the accuracy of each meter under test. All incipient and human errors inherent in " spot " test methods are eliminated. The indication of the meter errors at any time enables more accurate calibration, and an error band of ±0·1 per cent on heavy loads and ±0·3 per cent on light loads are the calibration target limits. Inaccurate meters with variable errors are easily located and rejected.

The equipment for attaining these highly accurate test conditions has been installed in a new extension to the Enfield factory of Sangamo Weston, Ltd. It is referred to as TRACE—" Test Recording and Calibrating Equipment." The method of test is based on a comparison between the known accuracy of a master meter and the accuracy of the meter under test. Electronic means are provided for converting pulses generated by rotation of the master meter disc into power for driving a series of synchronous motors, one in each test station. Each motor drives a drum containing a raised helix, the rotational speed of which is, therefore, proportional to the speed of the master meter disc. A spot on the disc of the meter under test interrupts reflected light on a photocell causing a printing bar to operate once for every disc revolution. The bar hits a portion of the raised helix on the synchronously-driven drum, and prints a series of dots on a paper tape positioned above the helix, the paper being inched forward for each operation. Thus, if the test meter has the exact speed of the master meter, the raised helix will always present the same position to the printing bar when it operates, and the dots will appear as a vertical line up the paper tape. Any deviation in speeds will cause the line of dots to appear off the vertical, the slope of which is a measure of the difference in accuracy of the test meter to the master meter.

Owing to the high order of accuracy of the equipment, however, its sensitivity to recording errors outside of a ±5 per cent band is somewhat restricted, and to expedite testing procedure, all new meters (without brake magnets) are submitted to a certain degree of precalibration before final calibration on TRACE. This consists of setting the low-load adjustment to give no disc rotation with voltage only applied to the meter, and setting the inductive adjustment to give no disc movement with full-load zero power factor applied. A stroboscopic test provides adjustment of the disc speed at full-load unity power factor with brake magnets fitted to the meter. At this stage most meters will be within ±1 per cent at full-load unity and 0·5 power factors, and ±2·5 per cent at one-sixtieth full load.

At an earlier stage during the assembly process, the train register of each meter is checked against an automatic counter and coded, which ensures the correctness of the registering mechanism, thus eliminating the necessity for costly long-period dial tests. After the precalibration process, all meters are checked for minimum operating watts before being loaded on to a conveyor belt which takes them to the TRACE benches for final calibration.

Test Recording and Calibrating Equipment

Two similar sets of test recording and calibrating equipment are shown in Fig. 1. Each set of TRACE consists essentially of a master control unit (shown in Fig. 5) containing remote controls for the power supplies from two mechanically coupled alternators with associated control equipment. Special master meters with appropriate cir-

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* Sangamo Weston, Ltd.

Testing

PERMANENT RECORD SYSTEM FOR ACCURACY CHECKING ON SINGLE-PHASE WATTHOUR METERS

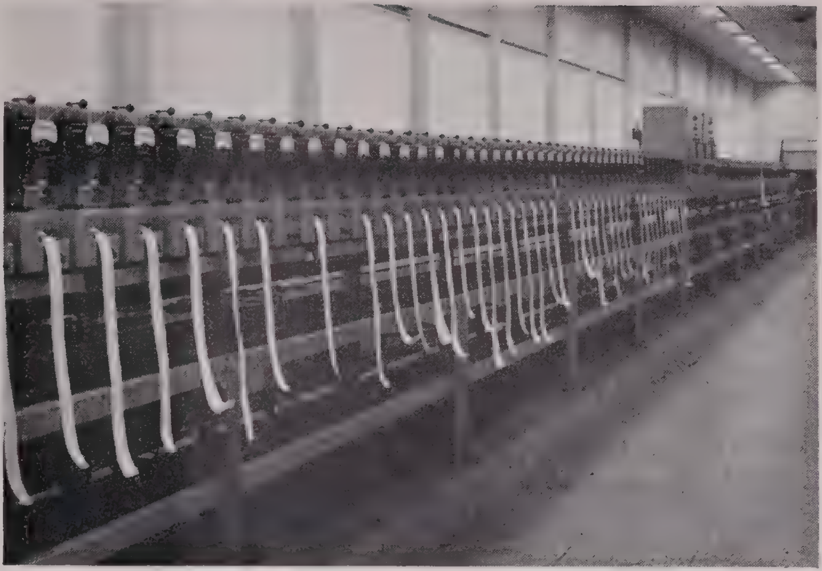

Fig. 1.—Two adjacent sets of TRACE test recording and calibrating equipment

cuitry are contained in the control unit and are connected to 50 individual test stations, each containing a test recording device. A block diagram indicating the principles of the scheme is given in Fig. 2.

Master Control Unit and Supplies

Two 2·5 kVA single-phase alternators are coupled to a d.c. motor drive, the speed of which may be altered by varying the armature voltage via an electronic control unit, whereby a frequency range from 35 to 70 c/s is obtainable. One alternator supplies the meter voltage circuits, and the other the meter series (load current) circuits, the stator on this second alternator being rotatable so that a phase displacement between the two output supplies may be obtained. Remote control of the phase displacement takes place at the control unit through a three-phase motor drive, and indication is made on an instrument by a selsyn repeater.

A frequency meter in the master control unit is connected across the output of one of the alternators, and a check of the frequency can be made and adjusted by the remote controls to the d.c. motor electronic control equipment. Frequency stability under all conditions of loading is attained by tachometer feedback which stabilises the drive supply to the d.c. motor.

The output voltages from the alternators are kept constant by a field excitation which is controlled by motorised Variacs, the output from these depending on the operation of a system of voltage-sensitive relays connected across the output of each alternator. These outputs are fed through a distribution board in the master control unit into two variable transformers; one of these feeds a current supply transformer, the secondary of which is connected to the meter series circuit and is adjustable from 0 to 100 A. The other transformer supplies the meter voltage circuit and is adjustable from 0 to 240 V, with switching for 120, 240 or 480 V ranges in each meter test station.

The master control unit contains special master meters calibrated for various frequency supplies, which may be selected by external switching and indicated by coloured lamps. The current coils of the master meters are fed from a common current transformer having a 1 A secondary current when the primary current is such that the master meter disc rotates at 40 r.p.m. Tappings on the secondary

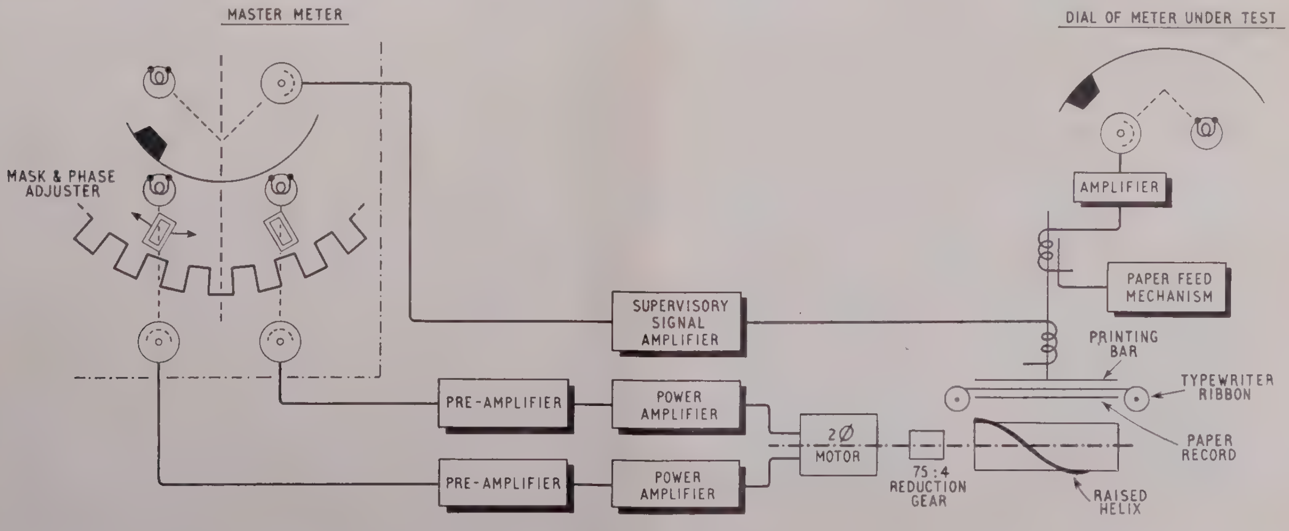

Fig. 2.—The principles of TRACE are given in this block diagram

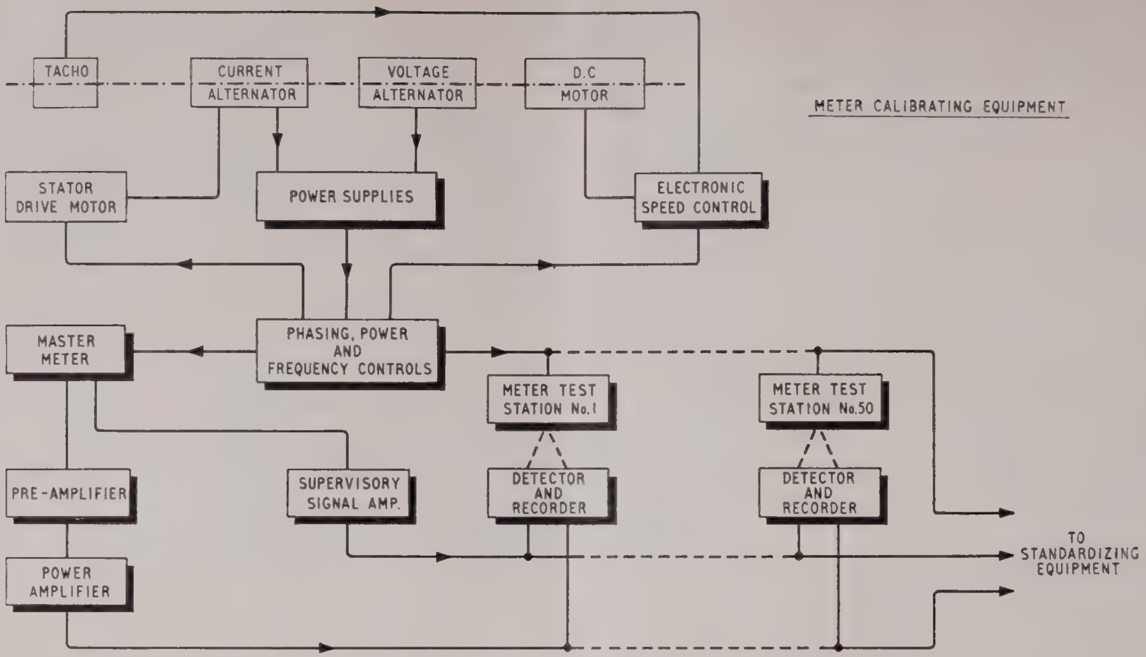

Fig. 3.—Block diagram of TRACE supplies

winding allow external adjustment of the master meter disc speed in steps of 0·1 per cent over a range of ±1·5 per cent, which compensates for any inherent errors in the master meter determined by standardisation.

The master meters have a normal type of drive element of high torque, and above the rotor a lightweight disc is mounted containing radial slots cut in its periphery to allow light to fall on two photocells beneath. A 90° phase displacement between the signals received is obtained by an adjustable template above the slotted disc.

The signal from each photocell is fed to one grid of a double triode connected in push-pull, and operates a high-speed telegraph relay connected between the anodes, which in turn controls two heavy duty relays having mercury wetted contacts. To ensure that the output from the telegraph relay is of square and not rectangular form, the bias for the input grid is taken from a potentiometer, and since the value of the bias depends upon the photocell output, each master meter is provided with its own pair of adjustable potentiometers. A smoothed d.c. supply is "chopped" into a square waveform by the mercury relays and fed to two-phase synchronous motors, operating on the hysteresis principle for maintaining synchronous torque and speed, one of which is installed in each meter test station. Hence the frequency of the input to the motors is controlled by the relays, the operational rates of which are dependent upon the speed of the master meter rotor carrying the slotted disc.

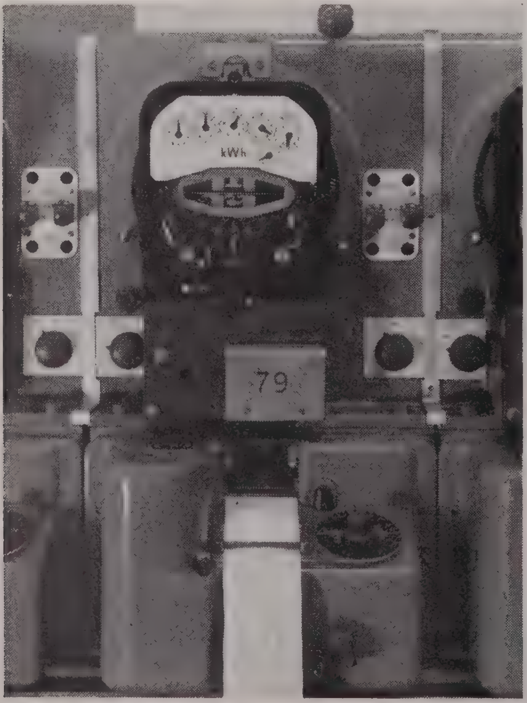

Fig. 4.—One of the meter test stations

One synchronous motor is situated in the master control unit and is used to indicate the master meter speed and for checking the phasing between the current and voltage supplies which is made at zero power factor.

The d.c. supplies are from a conventional rectifier circuit and a constant voltage transformer, to compensate for fluctuations in the mains supply voltage, supplies the relay and hysteresis motor power chassis. A block diagram of TRACE supplies is shown in Fig. 3.

Meter Test Stations

There are 50 meter test stations associated with each master control unit, and a general view of two complete sets comprising 100 meter test stations and two master control units is shown in Fig. 1. A close-up of one of the test stations is shown in Fig. 4.

The meter mounting mechanism has spring-loaded connections to ensure good contacts, assisted by a lever system which presses the meter down on to the contacts. A universal system of connections gives the equipment versatility to cater for the testing of a variety of meter types. Plugs for socket-connected meters are also included. Circuit selection is by switching, and plugs for shorting out the test station are provided.

The master meter in the control unit governs the speed at which the synchronous motor in each test station drives the drum carrying a raised helix beneath the paper strip (Fig. 2). A dot is printed on the paper by the action of a printing bar parallel to the axis of the drum, striking a typewriter ribbon between the paper and bar. The printing bar is operated by the interruption of a light beam reflected from the underside of the disc of the meter under test on to a photocell. The light is interrupted once for every revolution of the disc by a matt black sector on the disc. The light on the photocell causes it to conduct and so remove a steady 7 V negative bias from a triode amplifier, which causes the triode to conduct and energise a relay in its anode circuit. When the light beam is interrupted, the triode is biased beyond cut-off and the relay de-energises the closing contacts applying a 250 V pulse to the grid of a cold cathode tetrode, which then conducts and discharges a " tank " capacitor through a solenoid. The solenoid operates the printing bar and then inches the paper tape forward on a ratchet system. When the black spot on the disc has passed, the photocell and triode once more conduct and the relay is energised for the next operation.

A dot is thus printed for each revolution of the test meter disc, and a succession of dots is eventually produced on the paper tape. The slope of a line drawn through the dots gives the error of the meter under test compared with the master meter accuracy, and calibration for direct reading by a graticule on a scale follows a tangent law. For ±0·1 per cent, the incidence of the slope is large, and the variation in angle of incidence decreases until at errors of ±5 per cent and over, the error determination becomes less sensitive. For operation within ±1 per cent, however, the readability of the slope of the line is within 0·05 per cent accuracy, which makes this method of test particularly suitable for final calibration and test.

A check on the correct functioning of the equipment is made by a supervisory control, which consists of another solenoid which also actuates the printing bar but without inching the paper tape forward. It is operated by the interruption of a reflected light beam by two black spots on the underside of the master meter disc, which causes a relay in the control unit to initiate a 250 V pulse to the grid of another cold cathode tetrode and causes the valve to conduct. This discharges a second " tank " capacitor through the supervisory solenoid which operates the printing bar. This occurs twice during each revolution of the master meter disc, and since the spots are slightly displaced off-centre of the disc axis, two dots will appear side by side as a distinctive additional line up the paper tape. Any deviation in slope of the parallel lines indicates that the synchronous motor is not functioning correctly.

Each test station has its own interchangeable electronic chassis for facilitating quick replacement. It also has its own potential transformer with no discernible ratio or phase angle error, together with means of switching the voltage range. Potential link screws on the test meters are left closed.

Standardising Master Meters in Situ

A special unit incorporating equipment based on the TRACE principle, and consisting of groups of four standard meters, has been installed in an adjacent part of the test room to facilitate standardising procedure of the TRACE master meters. Each standard meter is similar in construction to the master meters, with its own photocells and electronic equipment.

The pulses from any of the groups of standard meters via amplifiers may be switched to drive four corresponding synchronous motors which are geared together through a double differential, the output shaft of which rotates at an average speed (and therefore average accuracy) of the standard meters. This shaft initiates a pulse to the printing bar solenoid, the interval between impulses being proportional to the average disc speed of the standard meters. This arrangement reduces the random overall error of any one meter in the group.

The averaging pointer speed attached to the differential shaft is frequently checked against a 12in dynamometer wattmeter (standardised by conventional d.c. potentiometer tests) and a crystal controlled auto-clock.

The master meters in the TRACE control unit are checked *in situ* against the standardising unit by appropriate switching, whereby the master meter supplies are transmitted to the unit, i.e master meters and standard meters have a common voltage and current supply. The TRACE master meter pulses are also arranged to drive a synchronous motor and drum with raised helix in the standardising unit, which is associated with the printing bar impulses initiated by the differential shaft of the standard meters. The resulting trace represents the comparative accuracy of the TRACE master meters against the standard meters' average accuracy.

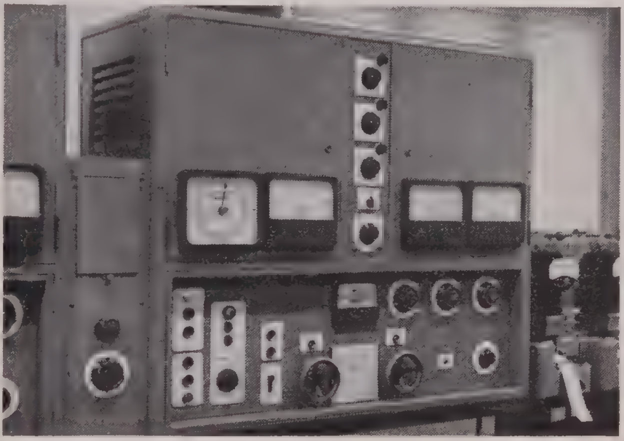

Fig. 5.—The master control unit contains the remote controls for the power supplies and master meters

These tests may be accomplished during normal operating conditions without suspension of work on the TRACE bench. Thus, a close control on the master meter accuracy can be attained on an almost continual basis.

Calibrating Procedure

Precalibrated meters are loaded on to the TRACE meter test stations from the conveyor belt, and controls adjusted to full load at appropriate voltage and frequency. The phasing between voltage and current supplies is set to unity power factor, and master meter errors may be corrected by adjustment of the appropriate control. The photocell exciter lamps to operate the printing bars are switched on, and each meter accuracy record commences. Calibration proceeds on the meter speed adjusters until vertical lines of dots appear.

The exciter lamps are switched off and the controls adjusted through the selsyn mechanism for 0·5 power factor lag, with a reset of the master meter corrections if necessary. The paper strips are pulled forward by depressing a small knob which releases the inching gear and frees the paper roll. This avoids confusion of groups of dots for subsequent tests. The exciter lamps are again switched on and the meter inductive adjusters set to give vertical lines of dots.

The above process is then repeated for one-sixtieth load, the controls and master meter corrections having been appropriately set, and a run of about seven dots is allowed to give a reasonable determination of accuracy. Adjustments are made to the meter low-load adjusters by an amount corresponding to the initial accuracy indicated. Most meters adjust to within ±0·3 per cent at the first or second attempt. Final checks are then taken on full-load unity and 0·5 power factors, by which time sufficient warm-up period to establish the meter accuracy has been allowed. The meters dealt with are fully compensated for temperature errors and warm-up effects are negligible. The paper strips recording final accuracy are torn off against a cutter bar and attached to the meters, which are now replaced on the conveyor belt for high-voltage insulation test and inspection. The paper strips are removed, accuracies interpreted on a portable graticule, and recorded. Thus, every meter has a permanently printed record of its calibration which is documented in files.

In practice, it has been found that one calibrator and a loader can deal with two sets of TRACE simultaneously, involving the calibration and testing of 100 meters at a time. The total time for this operation is about $1\frac{1}{2}$ hr, and a works' time analysis suggests that each meter takes approximately 1 min for the complete process. This is because there is virtually no waiting time for light-load tests, since the meters are being tested continuously, and results automatically recorded during calibration. When the last meter in the group has been adjusted, the first will have produced sufficient trace to determine its accuracy. At no time during the process is it necessary to disturb the bearing system of the meters by handling the discs.

To ensure high quality performance and accuracy, sample meters are selected at random and submitted to quality control inspection and test on a statistical basis. Sampling is made throughout the day so that a continuous survey of quality is available, the results being posted in histogram form for engineering assessment.

Future Development

Although the TRACE equipment described is semi-automatic in operation, enabling a large number of meters to be calibrated and tested by semi-skilled operators, the extension of the principle for automatic adjustment of meters without the necessity for calibrators is an obvious corollary. Relays which are sensitive to the synchronism existing between the master meter (driving the helical drum) and the test meters (operating the printing bar) have been devised to drive micrometer-operated adjustments through a mechanical linkage system. The auto-adjuster functions to calibrate the meter into exact synchronism with the master meter. It will cease to calibrate only when the printed dots trace a straight vertical line up the paper strip for zero error.

New C.E.G.B. Research Laboratories

NEW research and development laboratories were opened on 8th September in the North Western Region of the Central Electricity Generating Board by Mr. Leonard Rotherham, M.Sc., Board member for research. These laboratories occupy a new wing attached to the headquarters at Central Electricity House, Wilmslow Road, East Didsbury, Manchester. The head of the new department is Mr. J. Harvey, B.Sc., F.R.I.C.

Briefly, the laboratory's main effort will be in the fields of physics, chemistry, light current electrical engineering and metallurgy. The physics section will be concerned with the transformation of the energy in coal and oil into electrical power. The improvements which are sought call for a more thorough understanding of the many and varied physical characteristics of the components, ranging from the flow of wet coal to the properties of high-pressure steam. In addition, the handling of coal in a power station can be considered in physical terms and this constitutes a major subject.

The chemistry section will be concerned with the fields of corrosion and combustion, while the function of the electrical engineering section will be to develop circuits and instruments to cope with the trend towards automatic devices and precision instrumentation. The metallurgy section will be examining the problems involving materials in use in generating stations within the Region, and will be working to reduce the repair and maintenance costs involved in station operation in the field of materials. It will also be concerned with welding research, which is being undertaken on a regional as well as on a national basis. Main suppliers of electrical equipment were as follows:—Electrical installations, C. E. Barnes, Ltd., of Hull; lighting design and lighting fittings, the General Electric Co., Ltd.; and main cabling, the North Western Electricity Board.

Microwave Conference

A conference on microwave measurement techniques, organised by the Electronics and Communications Section of the Institution of Electrical Engineers, was held at the Institution from 6th to 8th September. The introductory session was held on the Wednesday morning and session 2 in the afternoon covered "Impedance, Admittance and Reflection Coefficients." The sessions on Thursday were devoted to "Power Measurement" and "Microwave Propagation Characteristics and Attenuation Measurements." The fifth session on the morning of the last day covered "Millimetre Wave Measurements" and in the afternoon various papers were presented on "Measurements on Materials."

Conference on ANALOGUE COMPUTATION

The third international conference on analogue computation was held in Northern Yugoslavia at the seaside resort of Opatija from 4th to 8th September. Representatives from twenty-five different countries were present and the total number of delegates was 246

BY A SPECIAL CORRESPONDENT

Working sessions at the international conference on analogue computation held recently at Opatija, Yugoslavia, were divided between three main sections. Section A dealt with analogue methods in mathematical and physical problems; B with analogue computation in systems engineering; and C with analogue and hybrid techniques and devices.

The papers presented in Section A were concerned with two classes of problem: (i) those of a mathematical nature, dealing with such things as truncation errors, and the solution of eigenvalue problems; and (ii) those dealing with field problems. In the first group, a paper of particular importance was that by Vichnevetsky[1] dealing with truncation errors in the use of finite difference techniques in the solution of partial differential equations. This paper bridged the gap between the numerical analyst and the engineer engaged in the solution of real problems. The other papers, except one, in this section attempted to solve problems on an analogue machine which would have been better solved on a digital.

The second group of papers in this section dealt with field problems such as the solution of the wave equation and the biharmonic equation. Typical amongst these problems was the simulation of the diffusion equation at successive time intervals in electrolytic tanks by Jones and Skinner.[2] The French seem to be the most active in this field, 13 out of the 21 papers being given in French. The equipment used in most of the applications was passive, i.e. networks of resistors, etc. This kind of equipment is cheap and particularly suitable for use in the study of the stresses in dams, the potential flow around aerofoils, etc., especially when the activity of the group using these networks is restricted to problems of this kind. Professor Redshaw,[3] of Birmingham University, said in private discussion that the cost of a 5,000-point network would be about 5s a point or node.

The papers given in Section B were of most interest to the non-specialist. Three papers were concerned with power systems, two being presented by delegates from Japan and one by an Australian. The first paper was about an economic load dispatching computer with analogue and digital units and was given by T. Arai.[4] The paper dealt with the calculation of the load dispatching in a system of hydraulic power plants in which some of the stations were distributed along the same river. This meant that the cost of power generation (price of water) for several stations were linked. The authors solved the load dispatching equations with the aid of an analogue machine and since some of the stations were linked together by the river an iteration technique was needed to solve the problem completely. The iterations were made on the digital computer.

The second paper[5] discussed the design and application of a hybrid computer. The hybrid computer consisted of both digital and analogue units in which the features of both of the techniques were combined to give the optimum in computation for this one application. The computer was developed as an economic load dispatcher and was first used to optimise a system consisting of two thermal and three hydro stations.

The third paper[6] was given by S. Kaneff and described the Adelaide University dynamic a.c. network analyser. This computer was developed by Kaneff in conjunction with the Electricity Trust of South Australia, to study the behaviour of the grid network around Adelaide. This computer compared favourably with the digital computer when only the solution of network problems was considered, but digital computers were capable of dealing with a much larger range of problems.

Nuclear Reactor Systems

Ten papers were devoted to nuclear reactor systems and most of them dealt with the problems associated with the simulation of reactors. Two of the papers[7, 8] were concerned with the spatial effects on large gas-cooled reactors, some attempt to explain the possible methods of the simulation of the reactor in three dimensions being given in the first paper.[7] The paper by Spurgin[9] dealt with the simulation of the type of heat exchanger which occurred in the present generation of British nuclear power stations.

On the whole, the papers in this section were a little disappointing in that they repeated work that had been published some time ago. Furthermore, no work was published on complete reactor systems although it is known that much work has been done in this field.

Although seven papers were presented on the subject of control systems only one of these was of general control interest. In this paper Bingulac[10] introduced the model-feedback concept and applied it to a rolling mill. The usual method of control is to use the deviation in an output variable from the plant to modify an input to the plant so as to produce a minimum deviation in the output available. The method of control considered here is to replace part of the actual plant by its analogue and then use the signal derived from this model to alter some of the input quantities to the plant. This concept is useful when the output variable cannot be measured directly. Also it is possible to change the time scale of the model so as to produce the expected deviations of the actual plant much more quickly.

The papers presented in the section on biological systems were interesting, especially those by Deland[11] and Karplus.[12] The paper by Deland dealt with the respiratory function of the lung. After listening to this paper one began to understand the complexity of the human body. The paper by Karplus contained a proposed generalised mathematical model capable of representing to a degree all animal locomotion techniques. One assumes that the purpose of this study was to investigate possible locomotion methods which would be suitable on the moon's surface.

Most of the papers on mathematical programming and statistics were of a statistical nature dealing with the effects of random events on a system; or by making use of stochastic signals to discover the dynamics of a system. The paper by Low[13] dealt with the first aspect and his problem was associated with the effects of noise on a radar system detecting intruders. A paper by Schweizer[14] used an artificial stochastic signal to excite a reactor system and then measured the usual correlations to obtain the transfer function of the reactor.

In the section on analogue and hybrid techniques and devices one saw the future of analogue computation as a gradual move towards digital computation with all its advantages in accuracy and memory. There were four papers on hybrid machines and computing devices. One of the more interesting was that given by Cundall[15] on the design and use of a combined analogue digital simulator. The team responsible for this paper were closely associated with the digital start-up of the 200 MW power station at West Thurrock. Mr. Cundall spoke about two typical applications of this simulator. One was a study of a ground-based missile guidance system and the other was the design of a digital control system, such as the West Thurrock system.

G. A. Korn[16] spoke about new high-speed analogue and analogue-digital computing techniques. The methods applied in this paper seemed to be akin to using digital units in an analogue manner, i.e. wiring digital units into an analogue machine.

The papers on analogue and hybrid programming and simulation were mainly concerned with the checking of the "set-up" of the analogue by various techniques. These papers were of interest only to persons concerned with the detailed programming and checking of the analogue "set-up." One such paper was that given by Brauning.[17]

A paper by Rideout[18] dealt with the simulation of delay circuits on an analogue computer. This method was based on the simulation of the dead time by a modified truncated Taylor's series. Kay's paper[19] considered the use of some of the usual analogue units to produce a function analyser. It was pointed out, however, that the paper by Spurgin[9] also gave a function analyser using more convenient units than that contained in paper.[19] The paper given by Petternella[20] gave circuits for the simulation of non-linear functions by silicon diodes and operation amplifiers.

Future Developments

It would seem from the conference proceedings that the emphasis has shifted from analogue to digital computational methods. Since the last analogue conference was held in Strasbourg in 1958 the accuracy of analogue machines has not altered whereas the speed of operation of digital machines has increased by at least a factor of ten. There has been no obvious step forward in analogue computation to compare with the obvious expansion in digital computing.

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[17] Brauning, G. "On the programming of electronic Analogue computers." *Paper* 1.

[18] King, W. J., and Rideout, V. C. "Improved transport delay circuits for analogue computer use." *Paper* 105.

[19] Key, K. A. "The analogue computer as a 'one cycle' transfer function analyser." *Paper* 34.

[20] Murgo, M., Petternella, M., and Ruberti, A. "Analogue simulation of non-linearity by means of selection circuits." *Paper* 25.

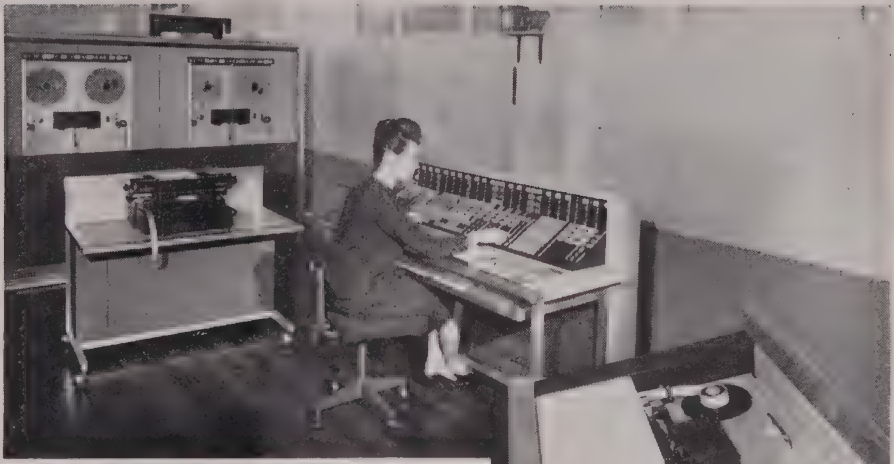
COURSES ON NUCLEAR ENERGY

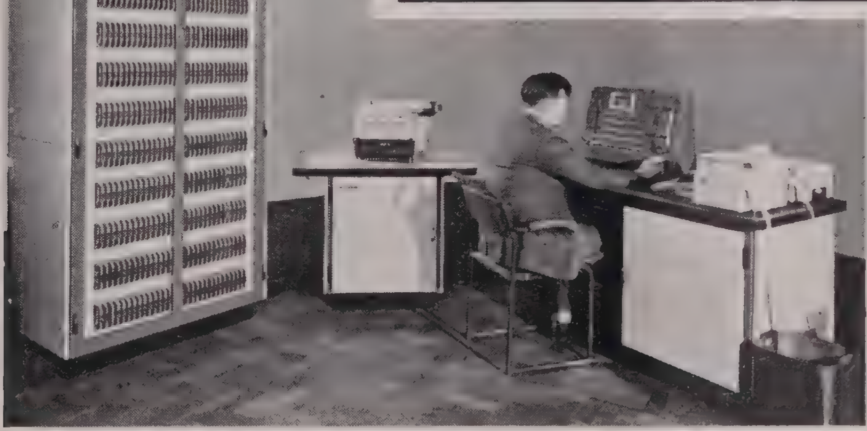
THE European Nuclear Energy Agency of the O.E.E.C. has published a new edition of its "Catalogue of Courses on Nuclear Energy in O.E.E.C. Countries." This catalogue is designed to help science and engineering students who wish to acquire knowledge of nuclear subjects to find out what training facilities are available. University authorities and others wishing to compare the programmes of technical establishments in the different countries will also find much relevant information.

The new catalogue covers the 1961-62 academic year and gives details of training courses in subjects relating to nuclear energy in some 180 Western European universities, technical high schools and research centres. It contains a list of establishments where courses are given and syllabuses of the main courses. Copies of the catalogue can be obtained on application to the O.E.E.C. European Nuclear Energy Agency, 38, Boulevard Suchet, Paris, 16.

COMPUTER BUREAU

ENGLISH ELECTRIC KDP10 SYSTEM IN USE FOR FIRST TIME





Above: Part of an English Electric KDP10 electronic data processing system, showing from left to right the monitor printing unit with magnetic tape units in the background, the control console and paper tape reader

Left: The KDN2 general purpose computer undergoing test at the English Electric Kidsgrove works

DURING the 1950's the English Electric Co., Ltd., pioneered the setting up in this country of electronic computer bureaux so that customers could bring or post their problems for solution on a time-hire basis. This company has now installed its first KDP10 data processing system in a new commercial bureau at Kidsgrove in Staffordshire. The new bureau will be complementary to the existing centres at Kidsgrove and at Queen's House, Kingsway, London, where three English Electric Deuce computers are already available for commercial, industrial and scientific work. The country-wide computer hire service now offered by English Electric is comparable to any in the world.

With all the manifold calculating and design problems of a large international company, with interests ranging from aircraft, nuclear power stations, hydro-electric schemes and railway locomotives to refrigerators and washing machines, English Electric were quick to establish their own central computing service after the war for the solution of power system and general design problems. The original service was run from the company's Nelson Research Laboratories at Stafford and when the first Deuces were completed in 1955, another bureau was opened in London and the time-hire service to outside customers became firmly established. Since then a great deal of work has been done for Government Departments, British Railways, the aircraft, motor and petroleum industries and many other fields of science, commerce and industry, and a comprehensive library of programmes and sub-routines has been built up. With the opening of the KDP10 bureau a new service will be available to commercial organisations, industries and public undertakings where the requirement for billing, stock control, progressing of accounts, etc., justifies the use of automatic data processing, and possibly the eventual purchase of a full-scale system.

The KDP10, which has been ordered recently by the Commercial Union Insurance Group, the Yorkshire Electricity Board and the Midland Bank, is a complete and fully transistorised data processing system embodying the latest techniques of advanced computer design. It is capable of handling alpha-numeric data and employs magnetic tape, punched paper tape and punched card input/output as well as printed output. These facilities allow the system to be integrated with any existing mechanised office and, by the use of magnetic tape, provide for the daily scrutiny and up-dating of records and files in organisations handling masses of detailed information. The magnetic core storage is expandable to provide for a very large capacity and its outstanding characteristics include a very high rate of transfer of information to and from the magnetic tape storage.

The system can record and transfer information on tape at the very high speed of 33,333 characters per second in the quantity required—unlike the conventional systems which provide for standard lengths of tape whatever the amount recorded. KDP10 also has a comprehensive automatic checking system which virtually eliminates chances of error in the input and output of information and ensures the accuracy of arithmetic calculations.

The KDP10 system consists of a number of integrated units covering high-speed store, programme control unit, tape selection and buffer unit and a console with associated monitor printers and paper tape punch, a paper tape reader and high-speed printers. The high-speed store is a random access magnetic core device which provides storage for programmes and data. This memory can be easily expanded to meet system requirements within the range of 16,000 to 260,000 characters.

The programme control unit is the arithmetic and logical control element of the computer which interprets and executes the instructions of the programme retained in the high-speed store and performs the automatic accuracy checks. The tape selection and buffer unit A allows for the connection of from one to eight tape stations to the computer and controls reading from and writing to magnetic tape on these stations. Programme instructions indicate the appropriate magnetic tape unit for input or output. The number of magnetic tape units directly controlled by the computer may be increased to 62 by connecting the tape selection unit B to each of the lines of unit A. The console provides for the complete monitoring of the operation of the computer and the on-line equipments. The complete system is readily adaptable to meet the requirements of both small and large organisations; for a smaller concern, wishing to allow for future growth, KDP10 can be built up, unit by unit, in proportion to the volume of work demanded of it without altering the basic installation.

Versatile Computer

Another computer which the company has just introduced, the KDN2, is the most versatile and inexpensive machine of its kind available today. Its applications cover the direct control of industrial processes, data processing and scientific computing, the scanning and recording of temperatures, pressures, etc., and " slave " work for large-scale computing systems such as English Electric's KDF9 and KDP10. It consists basically of three units:—(1) A cubicle containing the high-speed store, logical circuitry and the various power supply units and protective interlocks; (2) a control desk on which the paper tape reader and punch units are mounted and the control panel for switches, indicating lights, etc., for programming and operational control of the computer; and (3) a small cabinet supporting the electric typewriter and housing its associated power supplies and control circuitry.

High-Speed Operation

The logical circuitry of KDN2 is provided by the well-known English Electric Datapac units designed on the building block principle, which can cover over 70 different logical functions to build up any system of electronic data handling or control. The main store of the computer is provided by a transistor-driven ferrite core matrix and is expandable in increments of 512 18-bit words up to a maximum of 4,096 words. Auxiliary storage in the form of magnetic tape units can also be provided. The KDN2 will work through a normal programme at a rate of approximately 6,000 instructions per second, the actual speed of operation depending on the functions being obeyed.

As its standard input and output, KDN2 is fitted with paper tape reader and punch both operable at 20 characters per second. A wide range of peripheral equipment can be used with the computer to meet all applications. This includes faster paper tape equipment, card readers and punches, and binary and decimal keyboards. Switches, keys and counters may be used as input devices, and line printers, audible and visual alarms and lamp displays can be incorporated in the system as required.

For process control applications, appropriate input and output equipment can be provided together with analogue-to-digital and digital-to-analogue conversion units. Without modification to the central computer, special-purpose peripheral devices such as random number generators or photo-electric measuring devices can be incorporated as required.

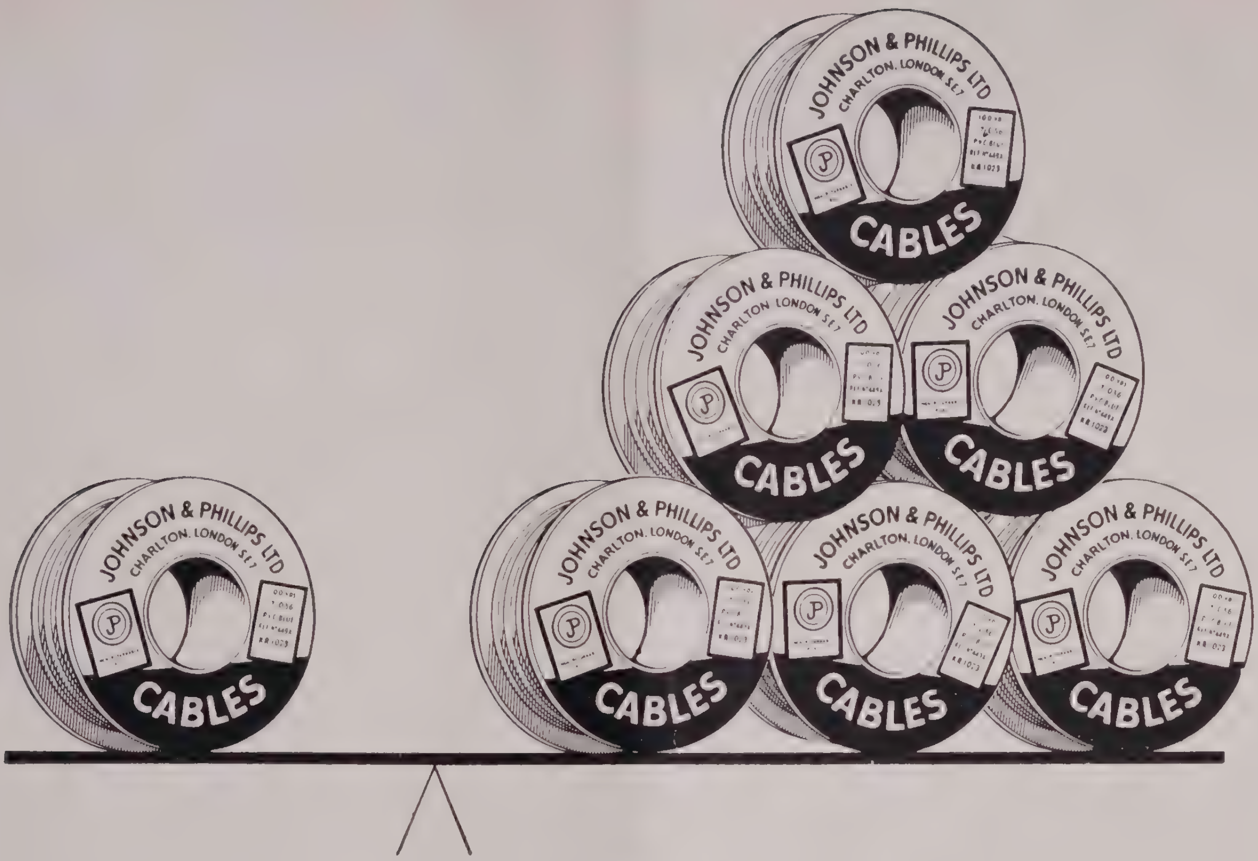
ENAMELLED COPPER CONDUCTORS

TWO revised British Standard Specifications for enamelled copper conductors, B.S. 156, Part 1, dealing with oleo-resinous enamel and B.S. 1844, Part 1, with enamel with vinyl acetal base, have recently been published. In these, changes made by amendments published since the previous editions appeared have been incorporated and some further changes made. Both specifications are now similar in general form to the recently published B.S. 3160 and B.S. 3188 which deal, respectively, with wires covered with polyester enamel and polyurethane enamel, but the test requirements differ according to the kind of enamel. The reference temperature for resistance measurements is now 20°C, as in other British Standards for covered winding wires.

The electric strength requirements of the four standards are now all closely in line, and the optional proof test for oleo-resinous enamel has been omitted from the new edition of B.S. 156. The period of the heat-ageing test for vinyl acetal enamel specified in B.S. 1844 has been extended from 72 to 96 hr except when the optional test for extractable matter is applied. The permitted proportion of extractable matter in this latter test has been reduced from 6·5 to 5·5 per cent. The loads for the abrasion test on this enamel have been revised.

No table of American sizes now appears either in B.S. 156 or B.S. 1844, as they are regarded as non-standard so far as British Standards are concerned. The optional test in hot transformer oil has also been omitted from both standards as it is considered that enamel that satisfies the other requirements of the specification will have adequate resistance to it.

Copies may be obtained from the British Standards Institution, 2, Park Street, London, W.1, price 7s 6d for B.S. 156, Part 1, and 8s 6d for B.S. 1844, Part 1.



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New Books

Case Studies in Electromagnetism. By Hermann A. Haus and John P. Penhune. Pp. 336; figs. John Wiley & Sons, Ltd., Gordon House, Greencoat Place, London, S.W.1. Price 52s.

The recent textbook "Electromagnetic Energy, Transmission and Radiation," by R. B. Adler, L. J. Chu and R. M. Fano, of the Massachusetts Institute of Technology, which was reviewed in the 16th December, 1960, issue of *Electrical Review,* contains a number of problems without solutions. The present volume contains 69 additional problems, closely related to the text, all extensively worked out, and a section on experiments. As a companion volume, therefore, it can be highly recommended, while the added section makes it of interest in its own right.

The book has ten chapters corresponding exactly to those in the text of the earlier book, the only part of the latter not illustrated by problems being the appendix on four-dimensional formulation of electrodynamics. The work of Adler, Chu and Fano is concerned with the rigorous and fundamental theory of electromagnetism in a form which can be applied to the circuits and energy convertors familiar to the electrical engineer, and finding suitable and tractable problems for such application is by no means easy. We all know, or should know, that a coil carrying an alternating current has in its vicinity not only an electrostatic field (zero-order) but an electric field (first-order) induced by the magnetic field (if the frequency is high enough there will be a higher-order magnetic field, and so on). How many electrical engineers, however, can work these fields out even in the simplest idealised case? Such cases of necessity form the subjects of these problems. Vector analysis and static fields earn fourteen each, while Chapter 10—Forces and Energy in Moving Systems—has only one. This last problem, however, "derives the equations for the operation of the three-phase induction motor from Maxwell's equations for moving bodies," and its solution fills sixteen pages. Eighteen pages are required for the solution of the three problems on "electromagnetic fields in the presence of moving matter," for which the authors admit it is not easy to find simple yet non-trivial examples. The thoroughness with which each problem is treated, and the representative nature of the selection, make the book an indispensable companion to the main text.

The six experiments in the second part are of fundamental interest and deal with (1) static fields; plots, duals, and analogues; (2) three-dimensional electrostatic fields and analogues; (3) the skin effect; (4) the frequency behaviour of a resistor and a capacitor; (5) the spherical coil; and (6) an electromechanical energy convertor. Each of these is the subject of a separate chapter with a full theoretical analysis, an account of the experimental procedure, and a number of discussion questions.—E.G.C.

Electronic Packaging With Resins. By Charles Harper. Pp. 339; figs. McGraw-Hill Publishing Co., Ltd., 95, Farringdon Street, London, E.C.4. Price 85s 6d.

The subject of this book may not be immediately evident from the title and a quotation from page 2 may not therefore be out of place—"The processes commonly used for packaging electronic equipment are embedment, potting, casting, encapsulation and impregnation." Of these, "potting" is perhaps the best known in this country and might be thought to be synonymous with most of the others, but the author, who is a senior engineer with the Westinghouse Electric Corporation, proceeds to define in more detail the special significance of each. "This book," he says, "has been written primarily to provide a better understanding of embedment-packaging materials and techniques for the persons engaged in the engineering and manufacturing of electronic packages who have little or no chemical training."

A list of the chapter headings will provide a concise guide to the contents:—Embedment packaging processes and their utilisation; polyesters and their modifications; epoxy resins; flexibilised epoxy resin systems; silicones, urethanes, polysulphides and other embedding materials; fillers, colorants and modifiers; foams and low-density compounds; thermally and electrically conductive compounds; effects of extreme environments; embedded packing for high temperatures; tools, fixtures and finishing operations; processing equipment; and manufacturing controls.

The author deals briefly in the first chapter with processes and terminology, materials and the practical significance of viscosity and of exothermic reactions. He also gives an excellent summary of both the advantages and the limitations of "electronic packaging." In the following chapters, devoted in turn to the main classes of chemical materials, he outlines in a superficial chemical way the mechanism of setting or curing of the various materials used. Though one sympathises with the difficulties of the author, it is doubtful, for example, if the electronic engineer can understand such terms as "unsaturated polyester." The task is not made any easier either for writer or reader by the proliferation of trade names for the many different (or often for the same) chemicals used in the formulation. Although references to American materials naturally predominate, those commonly used in this country are also listed.

Much useful information is given, in tabular form, for all classes of material commonly used. Due attention is also given to safety and health hazards, for example, to the curing agents used with epoxy resins. The section on fillers gives useful data on thermal and electrical properties. The book can be recommended to all concerned with the engineering or the chemical aspects of the subject.
R.C.C.

BOOKS RECEIVED

The Plasma State. By E. J. Hellund. Pp. 197; figs. Chapman & Hall, 37, Essex Street, London, W.C.2. Price 52s.

Digital Data. By D. S. Evans. Pp. 82; figs. Hilger & Watts, Ltd., 98, St. Pancras Way, London, N.W.1. Price 15s.

Electronic Measuring Instruments. By Harold E. Soisson. Pp. 352; figs. McGraw-Hill Publishing Co., Ltd., 95, Farringdon Street, London, E.C.4. Price 58s.

Fractional Horse-Power Motors. By Kennard C. Graham. Pp. 256; figs. Technical Press, Ltd., 112, Westbourne Grove, London, W.2. Price 42s.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents

Trams Need Not be Noisy

" REFLECTOR " wrote in your issue of 8th September on the 100 years that have passed since trams were introduced in London and the conspectus on the subject arranged at the Bishopsgate Institute, London, with the result for " Reflector " that " the past was vividly recalled; one could almost hear again the clash and rattle of the cars which were for so long a dominant component of London's traffic orchestra." " Reflector " is, of course, quite right about the clash and rattle of the London trams and the majority of people in this country believe it to be an essential characteristic of trams, whereas it is only a feature of antiquated, badly maintained and worn out rolling stock. It seems at least desirable that readers of the *Electrical Review* should know these facts.

The clash and rattle is one of the unsound reasons used for abandoning so many of our tramway systems. The only United Kingdom system that has of late years added any modern vehicles is that of Blackpool. The situation is different in many other countries and in this regard the writer recently had the opportunity of examining the tramway system of Göteborg, Sweden, where it is the backbone of the public transport in that fine city. Designed as a flexible system, all the cars are under headquarters radio supervisory control, much of the track is reserved and the vehicles normally work as two-car sets but coupling and uncoupling are automatic. Sets are split into single units for running on light traffic routes. They have very high acceleration, high speed and are practically silent. By comparison with our noisy air-polluting motor buses, their comfort is superb. Another very good thing about them is, of course, that they use electricity. The undertaking also operates some trolley-buses and motor buses.

Trolley-buses are, of course, excellent for certain urban traffic needs and are far superior to motor buses, but Göteborg's Sparvägar would not, like " Reflector," class them as the " refined sisters of the tram." Just " sisters " would be the highest rank accorded.

London, W.C.2. R. D. Reynolds.

" Mixed " Socket Outlets

I FEEL that I must protest at the recently advertised " Fireside Socket Outlet " consisting of one 13 A, three-pin, B.S. 1363 outlet and two 2 A, three-pin, B.S. 546 outlets mounted on a common plate. Presumably aimed at owners of ring main installations, this device destroys the outstanding virtue of the 13 A ring main system, namely, the ability to use any appliance anywhere in the house. The installation of such an outlet is the first step back to the bad old days of assorted sizes of two-pin and three-pin sockets, each with its own group of appliances that could only be used in certain places in the house.

Manchester, 14. A. D. R. Brealey, A.M.I.E.E.

Patent Office Fees

IN order that the announcement in the Press regarding increased Patent Office fees should not discourage impecunious inventors from protecting their ideas, I should like to point out that the fee for filing a patent application accompanied by a provisional specification is still retained at the nominal amount of £1 as heretofore; the increase from £4 to £10 refers only to the complete specification which must be filed within a year of the filing of the provisional, should the applicant desire to pursue the matter.

Little Baddow, Chelmsford. E. A. Payne.

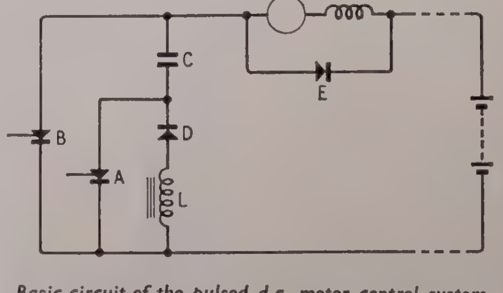
PULSED D.C. MOTOR CONTROL

THE latest battery-powered electric food delivery vehicle, the " Transitruck," to be produced by Smith's Delivery Vehicles, Ltd., incorporates a motor control system using silicon-controlled rectifiers. During starting the motor supply is pulsed at a frequency which increases as the vehicle accelerates. This results in an increase of the mean voltage applied to the motor, obtained without using series resistors and without their attendant power consumption.

Depending on the nature of the delivery round on which the vehicle is employed, a reduction in the power requirements of up to 20 per cent may be obtained, and this may be exploited by either increasing the vehicle range or maximum speed or reducing the battery capacity.

Another feature of the new truck is a built-in constant-current charger, also using silicon-controlled rectifiers, which eliminates the need for the vehicle to return to a specific charging point and so increases its flexibility. A mains cable 12ft long is supplied with the truck, which can thus be connected to any 13 A, 110-250 V, 50/60 c/s supply outlet.

On the prototype vehicle demonstrated at Gateshead-on-Tyne last week, the pulses were of 3½ msec duration,



Basic circuit of the pulsed d.c. motor control system incorporated in the Smith's " Transitruck " although this is not critical and, depending on the components used in the control circuit, can vary between 2 and 5 msec. In the basic circuit illustrated, the silicon-controlled rectifier (A) is made to conduct when "forward" or "reverse" is selected by the driver. Current flows through this and the motor, charging the capacitor (C). When this is fully charged, the s.c.r. (A) is cut off and the motor current is zero. Depressing the vehicle accelerator varies a potentiometer controlling the frequency of an oscillator circuit. The first output pulse from this fires s.c.r. (B), allowing current to flow through the motor. The capacitor discharges through the second s.c.r. and, via the 40 μH inductance (L), recharges with a reverse polarity, held by the diode (D). Some 3½ msec later, s.c.r. (A) is fired, discharging the capacitor which recharges with the original polarity, and the sequence is repeated when the next oscillator output pulse triggers s.c.r. (B). The pulse frequency is varied from 20 to 25 pulses/sec on starting up to 300 pulses/sec which, with the pulse length chosen, is continuous d.c. The diode (E) is provided to maintain current flow in the motor.

The development work was carried out in collaboration with Joyce, Loebl & Co., Ltd., who will manufacture the control and charging equipment under the auspices of a company specially formed for this purpose, Sevcon Engineering, Ltd., who hold world patent rights.

Unusual Cable Fault

A FAULT occurred recently in South London on the London Electricity Board's 22 kV cable system. The fault was located by conventional loop test methods, but before commencing excavations the Board's engineers made a check test using the shock discharge method by which an audible location can be made. Using this apparatus, the noise of a considerable amount of running water was heard, and the engineers concerned took the precaution of asking the Water Board and the Hydraulic Power Co. to shut off their supplies in the vicinity.

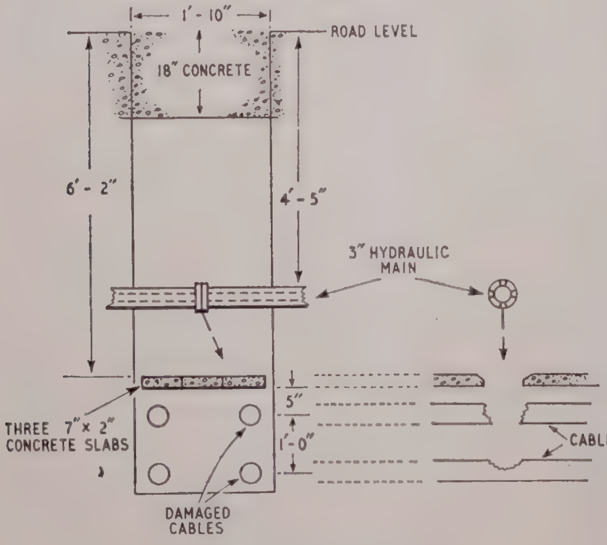


Fig. 1.—Section of cable trench

At the point located by these tests there are four e.h.v. cables laid 6ft under a roadway constructed of 18in of concrete. The cables are three-core, 0·25 sq in, paper-insulated, lead-covered steel wire armoured and water-proofed and were laid in 1928. They lie in square formation at 12in centres.

Upon breaking through the concrete cover, a large cavity was found due to the washing away of the sub-soil by water. At this point, a 3in high-pressure hydraulic power main crosses over the cables, and above one of the top cables there was a bolted flange joint on the hydraulic main. The relative positions of hydraulic main and cables are shown in Fig. 1. Failure of the hydraulic flange joint at the bottom had resulted in a fine jet of water of exceptional power from the hydraulic system, which uses water at 800 p.s.i. pressure. The top cable, which was in fact lying idle and disused, was found to be completely severed by the force of the water jet (Fig. 2). The bottom cable, on which the fault was detected, was partially eroded by the water, causing an earth fault on one core.

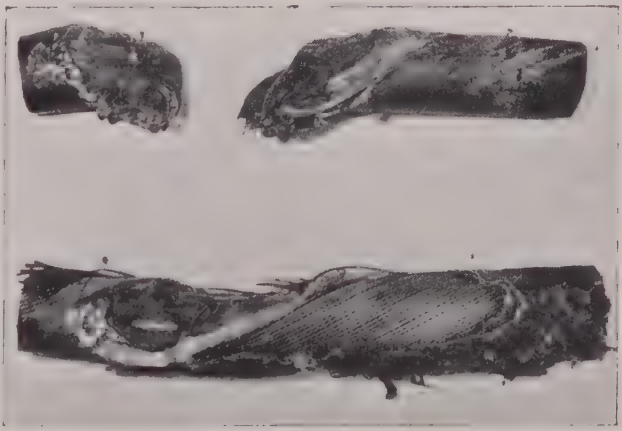


Fig. 2.—The two 22 kV cables shown in their relative positions as revealed by excavation on site

Cables such as this survived many bombing incidents without faulting during the last war. The sight of a cable of such tough construction completely severed is a most convincing demonstration of the power in a fine jet of water under high pressure.

VARNISH SURFACE FINISHES

A revision of the 1935 edition of B.S. 634, "Air-Drying Insulating Finishing Varnish for Electrical Purposes," covers two grades of air-drying insulating varnish for use as a finishing surface coating for electrical equipment. These grades are defined by their performance abilities. The original edition of the standard specified two types of varnish, one using spirit solvent and the other a non-alcoholic solvent, but this division has not been maintained. Copies of B.S. 634 may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1, price 4s.

Engineering in Europe

ABSTRACTS FROM FOREIGN TECHNICAL JOURNALS

LONG-DISTANCE transmission systems have to be designed with capacitive longitudinal compensation of the inductive line reactance or with synchronous condensers in the substations. The rating of this compensating equipment may rise for the very long lines now under consideration (e.g. 2,500 km long, at 650 kV) up to about a 2·2 kVA capacitor and 2·8 kVA reactor for each kW transmitted. Moreover, the switching operations involved are complicated and slow, and may provoke surges, etc. Synchronous condensers, on the other hand, cannot cope with considerable overloads and have appreciable losses.

The latter type can, with advantage, be replaced by saturable reactors and capacitors with programme control. For this purpose, a l.v. reactor, according to Libkind's patent, or certain other types of high-speed reactors, are suitable. It is even better to combine an automatically controlled h.v. reactor with the transformer, which results in a unit reducing the severity of surges and raising the transmitting capacity of the system. The design of this combination is described in the paper, with particular reference to the elimination of the odd harmonics.

The use of this compensating system is demonstrated by an application to the planned Volga-Moscow transmission system. The following advantages are gained: higher speed than synchronous condensers; greater voltage stability at intermediate points of the system, resulting in higher transmitting capacity and stability of the system as a whole; absence of any rotating machinery, making for more reliable and simpler operation; smaller capacitors and h.v. switchgear; a surge limitation, with reduction of acceptable level of insulation of line and equipment; and the possibility of supply to consumers along the line and of operating at maximum transmitting capacity without additional equipment.—" Long-Distance Transmission System with Saturable Reactor-Transformers and Forced Capacitor Banks," by D. I. Azar'ev, *Elektrichestvo*, No. 7, 1961, pp. 24-30, in Russian.

Turbo-Generator Rotor Vibrations

Vibrations of two-pole turbo-alternators with considerable numbers of short-circuited turns on one pole of the rotor winding are due to the non-uniformity of the magnetic stresses owing to the non-identity of the curves of flux density under the poles. It is relatively easy to determine the causes of vibrations when such turn short circuits occur in the rotor winding. The paper deals, however, with vibrations due to relatively small numbers of short-circuited turns, when there is no appreciable difference in the magnetic tensions of the poles. Non-uniform heating of the rotor steel by the field current is considered first, followed by the corresponding phenomenon where the flux distribution under the poles is distorted. The equalising currents in parallel branches of the stator winding set up by turn short circuits in the rotor winding are then determined.

The vibrations set up by a few turn short circuits are considered under the following assumptions: (a) that the amplitude of the vibration is proportional to the perturbing force, which may be represented by a vector; (b) that the forces acting on the cylindrical rotor over its whole length may be replaced by two forces applied to the rotor ends; (c) that the processes of generation and variation of the vibrations are considered only on one side of the rotor, so that the composition of the perturbing forces (vectors) may be carried out in one plane; and (d) absolute rigidity of the rotor. The conditions are then considered for variations of the exciting current and for load variations. An actual case of vibrations observed on a turbo-generator in service is then analysed and the remedies tried out are described. In the end only rewinding the rotor could eliminate the dangerous vibrations.—" Effect of Turn Short Circuits in a Turbo-Generator Rotor on the Rotor Vibrations," by K. A. Khudabashev, *Elektr. Stantsii*, No. 7, pp. 40-45, 1961, in Russian.

Testing Traction Motors

The following test sets were designed for the production control of traction motors and their auxiliaries:—

(1) A test set for controlling the electrical strength of the insulation of the armature coils. This is suitable for testing the insulation to frame and the turn insulation of 20 coils simultaneously. The operating coil sides are inserted for the test into a specially designed jig.

(2) A test set for controlling the inter-turn insulation of the armature coils of electrical machines wound with flexible wire. This enables several coils to be simultaneously tested for both parameters. The failure of a coil in this respect is indicated by signal lamps showing the pair of short-circuited terminals to which the defective coil is connected.

(3) A test set for checking the resistances of armature and other coils. It compares the tested resistance with that of a standard resistance box.

(4) A test set for controlling the temperature rise of machine windings.

(5) Instruments for detecting short-circuit turns in coils. These instruments are portable and have a core slid into the coil similar to tong-type instruments.

(6) A test set for detecting inter-bar short circuits in a commutator. The supply of the test voltage to the commutator bars is from a 6 V accumulator through a 100-200 c/s generator and transistor triodes, transformer and transistor rectifiers. A smoothing capacitor is inserted in the output.—" Equipment for the Control of the Electric Parameters of the Elements of Traction Machines and their Auxiliaries," by A. E. Sklyarov, *Vestnik Elektropromyshlennosti*, No. 5, pp. 54-58, 1961, in Russian.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review.*

PERSONAL AND SOCIAL

News of Men and Women of the Industry

The Minister of Transport has appointed **Mr. H. Perring** to succeed **Mr. R. A. Lovell**, C.B.E., A.M.I.Mech.E., as chief mechanical engineer. Mr. Lovell will retire next December and Mr. Perring will take up his new appointment at the beginning of that month. Mr. R. A. Lovell joined the Ministry of Transport in 1931. He was appointed deputy chief engineer (electrical and mechanical) in 1953 and redesignated chief mechanical engineer in 1958.

Mr. Perring is at present assistant chief engineer in the Ministry of Works.

Mr. Leonard H. Short, M.C. (director of overseas operations, English Electric Co., Ltd.), has been elected chairman of the Export Panel of the British Electrical and Allied Manufacturers' Association. The Panel is the chief advisory body to the B.E.A.M.A. Council on overseas trade. Mr. Short has been vice-chairman for the past two years and succeeds Mr. E. V. Small (consultant to Associated Electrical Industries Export, Ltd.) who has been chairman for this period. The new vice-chairman is **Mr. Harold P. Martin** (sales director of C. A. Parsons & Co., Ltd.).

Mr. R. A. Erskine, M.A., M.I.E.E., Mem. A.I.E.E., managing director of Erskine, Heap & Co., Ltd., is leaving in the second half of October for an extended tour of the Middle and Far East. He will be visiting Iran, West and East Pakistan, India, Burma, Malaya and Ceylon, and will be away for about seven weeks.

Mr. J. D. Glanville, at present with the United Kingdom Atomic Energy Authority at Risley, has been appointed a director of Richardsons, Westgarth & Co., Ltd., and will assume the responsibilities of group production director at the beginning of October. **Mr. W. R. Jones**, at present managing director of George Clark (Sunderland), Ltd., becomes group personnel director, and **Mr. H. Watson-Jones**, now managing director of Richardsons, Westgarth (Hartlepool), Ltd., becomes group commercial director. Both remain directors of the parent company. **Rear-Admiral J. G. C. Given** resigned from the board on 5th September and will cease to be managing director of the Marine Division of the Group on 30th September. From the same date the subsidiary companies (with the exception of the Humber Graving Dock & Engineering Co., Ltd.) will become production units with centralisation of the main functions at group headquarters, Wallsend, and will no longer come under the direction of individual managing directors.

Associated Electrical Industries, Ltd., announces the following appointments in its Turbine-Generator Division:—**Mr. J. S. Hall**, B.Sc.Tech., A.M.I.Mech.E., divisional assistant chief mechanical engineer (turbines); **Mr. J. V. Bigg**, M.A., A.M.I.Mech.E., A.M.I.Mar.E., divisional assistant chief mechanical engineer (auxiliary apparatus) and chief engineer, General Engineering Department; **Mr. D. M. Smith**, F.R.S., M.I.Mech.E., F.R.Ae.S., consulting mechanical engineer; **Mr. D. F. Shannon**, Ph.D., M.I.Mech.E., chief engineer, mechanical experimental development and gearing; **Mr. F. R. Harris**, B.Sc.(Eng.), A.M.I.Mech.E., chief engineer, advanced turbine development and chief engineer, Gas Turbine Engineering Department; **Mr. J. C. London**, B.Sc., M.I.Mech.E., A.M.I.C.E., chief engineer, large steam turbines; and **Mr. A. A. Garson**, M.A. (Cantab.), A.M.I.Mech.E., chief engineer, medium steam turbines.

Mr. Hall joined the mechanical drawing office of the Metropolitan-Vickers Electrical Co., Ltd., in 1927 and was later engaged in the development of steam turbine plant for land and marine service, and of certain gas turbine applications. He was appointed chief engineer, Steam Turbine Engineering Department, in 1956, and has been chief engineer, Large Steam Turbine Department, since 1959. Mr. Bigg was appointed chief engineer, General Engineering Department, in 1960, a position which he retains. Mr. Smith was associated with the Metropolitan-Vickers Electrical Co.'s gas turbine development work from its inception and became chief engineer, Gas Turbine Engineering Department, when that department was constituted in 1944. In that capacity he was responsible for the development of the "Beryl" and "Sapphire" jet engines, and the application of the gas turbine to marine propulsion, locomotives, and power generation. He was appointed chief engineer, mechanical engineering development, in 1956. Dr. Shannon joined Metropolitan-Vickers in 1944 and became assistant chief engineer, Gas Turbine Engineering Department. He transferred to the Gear Engineering Department in 1956 and in the following year was appointed chief engineer of the Department. Mr. Harris, a Met.-Vick college apprentice, was appointed chief engineer, Gas Turbine Engineering Department (Manchester), in 1958 and a year later became chief engineer, Gas Turbine Department. Mr. London has been assistant chief engineer (development), Large Steam Turbine Department, since 1959, and Mr. Garson was assistant to the chief engineer, Steam Turbine Engineering Department, Rugby Works, before his present appointment.

Mr. P. G. Leven has been appointed field sales manager to Edmundsons Electrical Wholesalers, Ltd. Mr. Leven was formerly sales manager of the Ascot Lamp & Lighting Co., Ltd.

Mr. P. G. Leven

Mr. E. D. Holdup, M.Sc., A.M.I.E.E., has been transferred from the position of superintendent of the R. L. Hearn generating station to that of superintendent of the Ontario Hydro-Electric Power Commission's new Lakeview generating station, near Toronto, which is scheduled for commercial operation this autumn.

Mr. Frank Pearce, formerly with Troughton & Young, has been appointed senior contracts engineer with Mortimer, Gall & Co., Ltd.

The B.B.C. has appointed **Mr. H. C. J. Tarner**, A.M.I.E.E., A.M.Brit.I.R.E., as engineer-in-charge, television (news), in succession to **Mr. A. D. D. Strathairn**, who has retired.

Mr. S. M. Smith has become an associate director of Arthur Scull & Son, Ltd., and managing director of Scull Electrical, Ltd. He has also been appointed Bristol general manager in which capacity he will be concerned with the group design and contracting service.

On medical advice **Sir Edward Lewis**, chairman of the Decca group of companies, has resigned from the Committee on Consumer Protection. The President of the Board of Trade has decided not to make a further appointment to the Committee at this advanced stage of its proceedings.

Mr. E. Nicholson, F.C.A., has been appointed financial controller of the Engineering Group of the General Electric Co., Ltd. He took up his duties on 12th September by arrangement with the United Kingdom Atomic Energy Authority, of whose Production Group he was formerly a deputy director.

Mr. J. A. Broughall, B.Sc.(Eng.), M.I.E.E., M.I.Loco.E., assistant chief electrical engineer, British Transport Commission, read a paper on Britain's experience in electrification at a railway conference held in Rio de Janeiro from 11th to 19th September.

Mr. H. Weston Howard, C.B.E., has been appointed chairman and **Mr. A. C. Ball** managing director of Hayward Tyler & Co., Ltd., manufacturers of pumps and turbines.

Mr. L. D. Kreps has joined Telequipment as chief development engineer. Mr. Kreps has previously been engaged on oscilloscope development with E.M.I. Electronics and Marconi Instruments, Ltd.

Mr. F. T. Jones, A.M.I.Prod.E., has been appointed a director and **Mr. J. A. Grace** commercial director of Microcell, Ltd., a subsidiary of BTR Industries, Ltd.

Mr. R. I. Douglas has been appointed export sales manager of Permali, Ltd. He will continue to be responsible for the sale of track insulation, etc., to British Railways.

Mr. R. W. Jelbart, sales manager to the Thermostat Division of R. B. Pullin & Co., Ltd., has been additionally appointed sales manager to the Traffic Barrier Division.

Mr. P. V. Lister has been appointed assistant to the commercial director of Associated Electrical Industries (Woolwich), Ltd. This is the management company for the A.E.I. Product Divisions and subsidiary companies in the Woolwich Group. Mr. Lister joined the Edison Swan Electric Co., Ltd., in 1949 and two years later took charge of the company's Sales Planning Department. In 1959, after the merger with Siemens Brothers, Ltd., to form Siemens Edison Swan, Ltd., he became responsible for sales of valves and cathode ray tubes to television and radio set makers. Last year, when A.E.I. was reorganised and a divisional structure introduced, he became sales manager of A.E.I. Radio and Electronic Components Division and subsequently was appointed commercial manager of the Division.

Mr. R. Meikle, B.Sc., Dipl.R.T.C. (Mech. Eng.), has been appointed assistant superintendent, Large Electrical Plant Department, at the Trafford Park Works of Associated Electrical Industries (Manchester), Ltd. Since 1956 he had been assistant superintendent of electrical assemblies at the Larne factory.

Mr. A. Roxburgh, A.M.I.E.E., who has been appointed divisional assistant chief engineer (design) of the A.E.I. Switchgear Division, served his apprenticeship with the British Thomson-Houston Co., Ltd., from 1931 to 1936. He was appointed circuit-breaker designer in 1947, development engineer in 1953 and chief engineer of the Willesden works in 1959.

All tickets have been sold for the **Association of Supervising Electrical Engineers'** Christmas Gala Ladies' Evening, to be held at the Connaught Rooms, London, on Saturday, 16th December. The guest of honour will be Lady Jackson, wife of the Association's president, Sir Willis Jackson, F.R.S.

WILLS

Lt.-Col. R. K. Morcom, C.B.E., M.A., M.I.E.E., M.I.C.E., M.I.N.A., chairman of Belliss & Morcom, Ltd., who died on 5th May last, intestate, left £107,206 gross (£105,859 net).

Mr. Geoffrey Parr, M.I.E.E., late honorary secretary of the Television Society, who died on 30th May, left £9,430 gross (£8,495 net).

Mr. M. D. W. Stonehouse, M.B.E., M.I.E.E., distribution liaison technical engineer to the Electricity Council, who died on 15th May, left £10,729 gross (£9,375 net).

Councillor S. J. Wright, managing director of S. J. Wright, Ltd., electrical contractors, Maidstone, who died on 18th May, left £11,867 gross (£11,354 net).

Mr. A. G. Long, managing director of Armature & Electrical Repairs, Ltd., who died on 23rd June, left £20,333 gross (£20,184 net).

Mr. C. E. Rickard, O.B.E., F.P.S., M.I.M.E., M.I.E.E., late general manager, Marconi's Wireless Telegraph Co., Ltd., who died on 11th May, left £18,339 gross (£18,229 net).

Mr. L. P. Hassauer, chairman and managing director of Aidas Electric, Ltd., who died on 19th December last, left estate in Great Britain valued at £43,369 gross (£43,260 net value).

POWER STATION CONTRACTS

THE Central Electricity Generating Board has placed contracts during the past two months amounting in the aggregate to approximately £23 million. They include the following:—

Blyth "B" power station: Heating, lighting and plug point installation for turbine house, boiler house and ancillary buildings.—F. H. Wheeler & Co. H.p. pipework and valves for Nos. 7 and 8 turbo-generators and boilers.—John Thompson (Pipework). Foundations for building, switchgear conductor structures, fencing and drainage at 275 kV switchgear compound.—Sir Robert McAlpine & Sons (North Eastern).

Thorpe Marsh power station: Three 4,800,000 g.p.h. natural draught cooling towers.—Davenport Engineering Co. 11 kV switchgear and accessories. —A. Reyrolle & Co. Two 310 MVA, 275 kV generator transformers.—Associated Electrical Industries. 3·3 kV switchgear and accessories.—English Electric Co. Fixed fire fighting equipment.—Matthew, Hall & Co.

West Burton power station: Coal handling plant.—Birtley Engineering. Main c.w. pumps and motors associated with Nos. 1 to 4 500 MW turbo-generators.—Gwynnes Pumps. Site electricity supply (stage one).—James Scott (Electrical Engineers).

Drakelow "C" power station: 11 kV auxiliary switchgear units Nos. 9 and 10.—A. Reyrolle & Co. Civil works for coal, ash and dust plant.—J. L. Kier & Co. Two 350 MW reheat boilers.—John Thompson Water Tube Boilers. Contactor control gear (stage two).—Laurence, Scott & Electromotors.

Aberthaw power station: 13·8 kV and lower voltage cables and accessories.—London Electricity Board.

Dungeness power station: 275 kV switch house (civil works).—Sir Robert McAlpine & Sons. 275 kV air-blast switchgear.—A. Reyrolle & Co.

Richborough power station: Power, control and auxiliary cables.—London Electricity Board.

Tilbury "B" power station: Pile casting and driving.—Holloway Bros. (London).

West Thurrock power station: Installation of lighting, heating, telephones and ancillary services associated with sets 1-4.—James Kilpatrick & Son. 275 kV switchgear extension. —A. Reyrolle & Co.

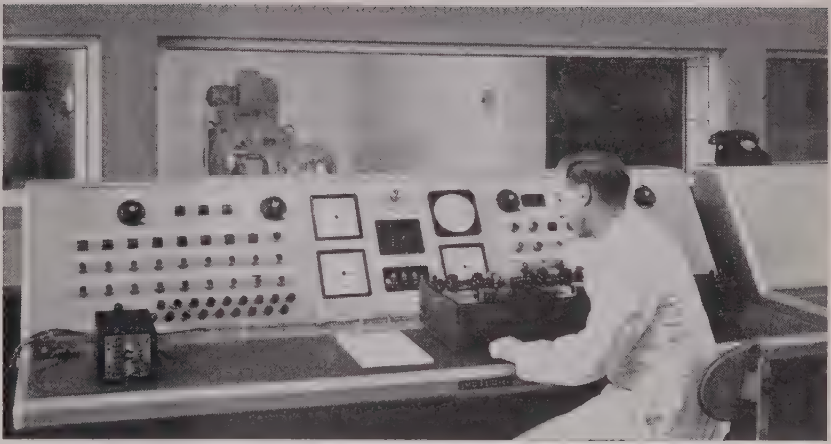
Marchwood Central Engineering Laboratories: Construction, completion and maintenance for the maintenance period.—Taylor Woodrow Construction. D.c. research equipment.—English Electric Co.

INDUSTRIAL NEWS

Aircraft System Laboratory

A LABORATORY for testing and developing aircraft generation systems has been built for the Plessey Co., Ltd., at Eastern Avenue West, Romford, Essex. It covers a floor area of 15,000 sq ft, and the initial installation, currently proving a four generator system of 160 kVA total for the Vickers VC 10 aircraft, is capable of handling four paralleled channels of equipment up to 120 kVA normal load per channel with complete simulation of environmental conditions likely to be met by aircraft of the next decade. Future projects include systems testing for the BAC 111 and for military aircraft. The generator drives have a speed range in excess of 3·1 with controlled acceleration up to 1,200 r.p.m./sec and a capacity of 200 h.p. per drive. Three-phase loading, both resistive and reactive, is variable between zero and 150 kVA per channel. The cooling facilities installed permit direct simulation of supersonic flight conditions.

Generation electronic control equipment is tested by point-to-point fault location consoles, which can be programmed by punched tape for automatic continuity and wiring verification on any type of control or ancillary unit. A hot and cold chamber enables small associated equipments to be checked over the entire environmental temperature range. Temperatures obtainable range from −60°C to +120°C, and this range can be totally encompassed within one hour.



Testing a 40 kVA system in the Plessey generation systems laboratory

In addition to the main engineering and testing bays, the building includes a drawing and design office, a receiving inspection section for incoming systems, a photographic darkroom, administrative offices, and stores. A 1·5 MVA substation has been installed by the Eastern Electricity Board to meet the added demand on the public supply.

E.T.U.'s FUTURE POLICY

A proposal by the new general secretary of the Electrical Trades Union, Mr. J. T. Byrne, that the T.U.C. should be asked to await the result of the appeal of the defendants in the recent legal action before expelling the union was defeated at an E.T.U. Executive Council meeting last Sunday. Suggestions that outstanding writs against the union and officials should be withdrawn and that Mr. L. Cannon, personal assistant to Mr. Byrne, should be dismissed were also rejected. Instead it was agreed to refer to a sub-executive meeting a proposal to set up a small committee to endeavour to settle internal differences and make recommendations on the union's future course.

Official Opening of Drakelow "B"

The Central Electricity Generating Board's Drakelow "B" power station, on the River Trent, near Burton, is to be opened by Col. Sir Ian Walker-Okeover, Lord Lieutenant of Derbyshire, on 20th October.

Industrial Opportunities in Ireland

ABUNDANT labour, freedom from taxation and generous capital grants are among the incentives which the Irish Government offer to encourage manufacturers to establish export industries in the Republic. To stimulate further industrialisation, the Industrial Development Authority has appointed Mr. G. B. MacCarthy as its permanent representative in Britain and an exhibition, "Irish Industrial Development—Window on Shannon," is open at the Irish Export Centre, 235, Regent Street, London, W.1, until 29th September. The assistance and facilities available are described in a booklet "Opportunities for Industrialists."

The number of British firms establishing factories in Ireland has fallen from a third to only 15 per cent of the total in recent years. Electrical manufacture for export started since 1955 includes the following products: accessories (British), lamps (Dutch), domestic appliances (Dutch and British), transistor radios (Japan), radios and gramophones (South Africa), electric organs and capacitors (United States).

Deep-Sea Oceanographic Winch

A new type of electro-hydraulic deep-sea oceanographic winch recently exported to Canada by the Telegraph Construction & Maintenance Co., Ltd., a member of the B.I.C.C. Group, was specially designed and manufactured to the requirements of the Department of Mines and Technical Surveys of Canada for installation in one of their vessels. The barrel of the winch accommodates 30,000ft of $\frac{3}{16}$in diameter wire. Works tests were made to simulate as closely as possible actual working conditions, and installation on board was simplified by "unit construction" methods.

MORE COOKERS SOLD

The latest return of domestic electrical appliance sales issued by the Electricity Council shows that 20 per cent more cookers were sold by Area Electricity Boards in July than in the corresponding month of 1960 and over the whole twelve months there was an improvement of 3·8 per cent. Sales of refrigerators, the next largest item numerically in the list, rose sharply in July but the total for the twelve months was still below the level of the previous year, and this was also the case with washing machines.

Area Boards' Domestic Appliance Sales

Type of Appliance	Month ended 31st July, 1961		Twelve months ended 31st July, 1961	
	Total	Change %	Total	Change %
Cookers ...	32,166	+20·1	351,713	+ 3·8
Water Heaters				
Immersion	24,388	+ 4·2	194,371	+ 1·1
Storage ...	5,366	− 2·5	63,523	− 4·9
Wash Boilers	4,561	+ 0·4	54,409	−10·8
Washing Machines ...	11,324	+57·7	104,319	−25·2
Refrigerators	30,938	+88·4	139,854	− 9·8
Clothes Dryers	1,983	−42·5	53,897	n.a.

Rural Power Progress

UPWARDS of 83 per cent of the farms in the Midlands Electricity Board's Shropshire and Herefordshire Area now have mains electricity compared with only 22 per cent when the Board was established in 1948. A progress report issued this week by the area manager, Mr. W. Winwood, says that last year the Area engineering staff broke all previous records by adding nearly 400 miles of mains and about 1,000 substations to the distribution system. The 5,300 new consumers connected during the year included nearly 700 farms. In the five years since 1956 sales have increased from about 380 million to nearly 640 million kWh annually. There are now nearly 8,000 farms on supply compared with 5,113 five years ago, and only 2,111 in 1948.

The majority of the larger development schemes are now completed, nearing completion or scheduled in current programmes, and by next spring it is hoped to have connected about 600 more farms, bringing the number on supply to about 8,600 or nearly 90 per cent of the estimated total of 9,600 in the Shropshire and Herefordshire Area.

Capital expenditure in the Area is now running at about £1,200,000 annually, of which about £350,000 is being devoted to the rural development programme. Much of the remainder is for essential reinforcement of the system to meet the load, which is growing at an exceptional rate.

Over half of the 2,850 miles of high voltage overhead lines are now protected against transient faults. This protection, Mr. Winwood says, is given by high-speed auto-reclosers, the use of which was pioneered in this country by the M.E.B. This year £18,500 is being devoted to this work, to increase further the reliability of supplies in the rural areas.

The chairman of the Midlands Board, Mr. W. S. Lewis, commenting on the report, said it was gratifying to note that the farmers in the two counties were now making good use of electricity for crop drying, bulk milk tanks, heating and ventilation of broiler houses, and other modern aids to agricultural efficiency, and the average annual farm consumption had risen sharply. "We have made great strides with our rural development programme and in the M.E.B. area as a whole we now have 87·4 per cent of farms on supply, having passed the national target figure of 85 per cent two years ahead of the target date," he said.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £186 0s 0d
COPPER, H.C. Electro	ton £229 10s 6d
Fire Refined 99·70%	ton £228 0s 0d
Fire Refined 99·50%	ton £227 0s 0d
COPPER Tubes ..	lb 2s 3⅞d
Sheet	ton £265 5s 0d
H.C. Wire and strip	ton £284 5s 0d
LEAD, English ..	ton £64 5s 0d
Foreign	ton £63 0s 0d
MERCURY	flask £63 0s 0d
TIN, block (English) ..	ton £942 0s 0d
ZINC, G.O.B. Foreign	ton £74 5s 6d
BRASS Tubes (solid drawn)	lb 1s 10⅛d
Wire	lb 2s 8½d
PHOSPHOR BRONZE Wire	lb 4s 2½d
PLATINUM	oz £30 5s 0d
RUBBER, No. 1 R.S.S. spot	lb 25½d—25⅝d

Electricity at the Willesden Show

THE Willesden Show is the highlight of the borough's annual entertainment activities and retains its popularity. At this year's event, held in Roundwood Park on 9th and 10th September, the London Electricity Board (North Western District) once again provided a marquee in which a wide range of domestic apparatus was displayed, with special emphasis on cooking and water heating. The following manufacturers co-operated: Electrolux, Ltd., Wilkins & Mitchell, Ltd., Revo Electric Co., Ltd., Falco Allied Ironfounders, Ltd. (Electrical Appliance Division), General Electric Co. (Domestic Equipment), Ltd., Moffatts, Ltd., Hoover, Ltd., Tricity Cookers, Ltd., Belling & Co., Ltd., Radiation, Ltd. (Parnall/Jackson), Simplex Electric Co., Ltd., and the English Electric Co., Ltd.

About 35,000 people attended the show. In addition to the Board's marquee, the District contracting department carried out all the electrical work for the general and decorative lighting installation.

The L.E.B. marquee at the Willesden Show

EVERSHED MOTOR DIVISION

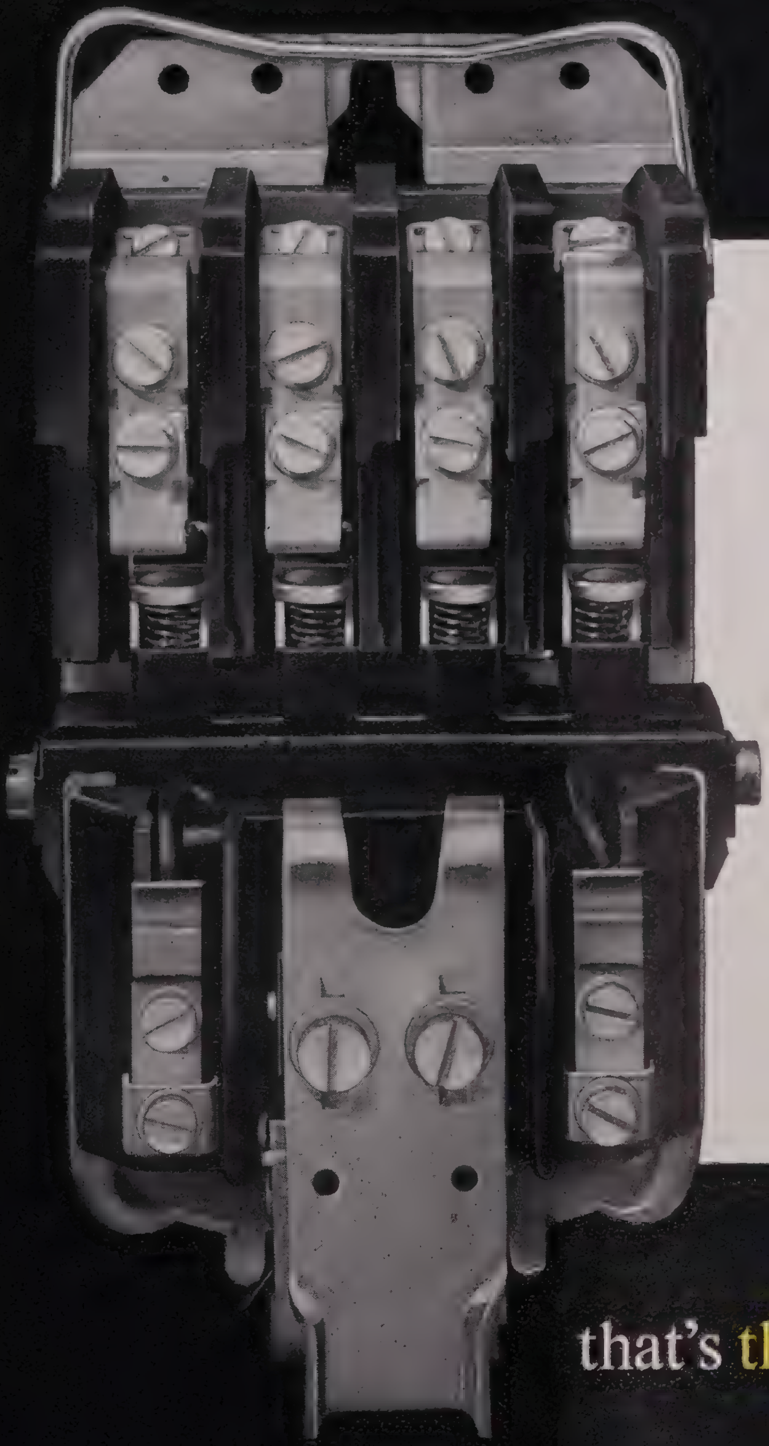
A new division of Evershed & Vignoles, Ltd., has been established at Devonshire Works, Dukes Avenue, Chiswick, to meet the increasing volume of orders and permit further expansion of their fractional horsepower motor business. Mr. E. H. Werninck, chief applications engineer, who deals with home and export sales, has also moved to the new premises and his telephone number is Chiswick 7801.

EDUCATIONAL

Leaflets are available from Hendon Technical College, The Burroughs, N.W.4, giving details of short courses of lectures in the Department of Electrical Engineering. The subjects include transistors and transistor design, electronics for engineers, digital computers, wave filter design, mathematics for engineers and applications of radio-isotopes.

A course of six lectures on "Fuel Cells for Power Production" is to be given at the Polytechnic, Regent Street, London, W.1, commencing on 16th October.

This *new* G.E.C. Contactor performs a minimum of 5 million operations without wear affecting performance



The G.E.C. Installation Equipment Group has *the new approach* to designing contactors. Several important features contribute to an outstanding performance:

- * *Noise suppression* by rubber mountings between contactors and case.
- * *Ease of installation and maintenance.* Generous wiring space in enclosed contactors and ample knockout entries in pressed steel case.
- * *Easily replaceable silver faced contacts* (two breaks per pole).
- * *Good arc-resisting and non-tracking properties* of moulded arc box.
- * *All models* in the new range of G.E.C. Contactors (20 amp—200 amp A.C., 40 amp D.C.) exceed the requirements of BS775:1956 and may be fitted with side-mounted auxiliary switches, neutral links, paralleling links and control fuses.

COMPETITIVE PRICES
G.E.C. Contactors are available at very competitive prices, too.

IMMEDIATE DELIVERY from wholesalers throughout the country. For further information ask your wholesaler for G.E.C. publication X5366.

that's the New Approach of G.E.C.

INSTALLATION EQUIPMENT GROUP

PROLONG POLE LIFE
PRINSOTE the new wrap-around pole dressing

Prinsote protects wooden poles where they need it most. It recharges with a high creosote concentration the vital area of pole above and below the ground line.

Prinsote protection involves no waste—easy-to-apply treatment gives poles longer life.

PRINSOTE

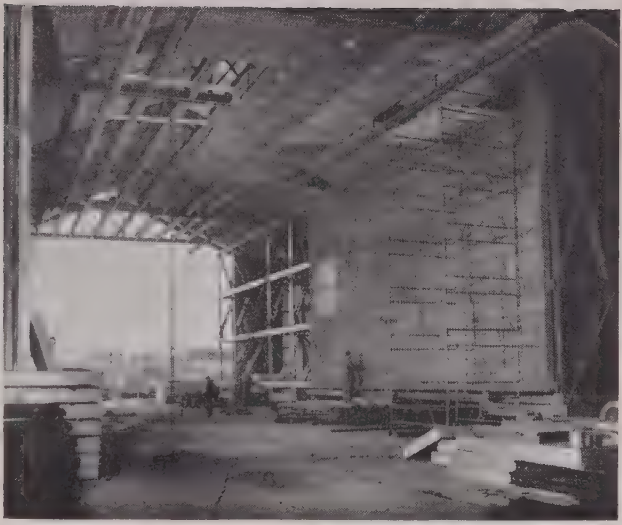
For illustrated brochure giving further information apply to:

BURT, BOULTON & HAYWOOD LIMITED,
Brettenham House, Lancaster Place,
London, W.C.2.
Telephone: Temple Bar 5801

Large Stress Relieving Furnace

AN electric furnace installed at the Thornaby-on-Tees Works of Head Wrightson Teesdale, Ltd., is 27ft by 27ft by 80ft long and is capable of stress relieving nuclear heat exchangers and other large fabrications. No firebrick is used, the hearth, walls and roof mainly consist of 8ft square mild steel panels, filled with compressed mineral wool slabs, and held in place by flexible mild steel sheeting. The roof panels are affixed to longitudinal girders at roof truss height and the walls are movable on transverse bogies. The end walls are lifted on in two pieces by a mobile crane. The fabrication is supported on cradles, carried on the bogies which carry the furnace floor, also in panel form.

The 1,500 kW electrical elements, at mains voltage, are arranged in 40 kW units, each comprising 12 coiled elements in sintered alumina sleeves supported in stainless steel channels resting on frameworks placed on the furnace floor. A 40ft length of the furnace was completed recently and used to stress relieve a fabrication within limits of 610°C minimum and 630°C maximum. The furnace is used during off-peak conditions and if well loaded enables stress relieving to be carried out for a cost of less than £1 per ton in electricity consumed. The furnace, which was originally ordered for the stress relief of four heat exchangers for the Dungeness nuclear power station (each 24ft dia. by 80ft long and 330 tons in weight), was designed by Cooper Electroheat, Ltd., who also supplied the furnace panels and electroheat units.



Erecting the stress relieving furnace at the Head Wrightson Teesdale, Ltd., works

Export Training

An export training centre for top management, the first of its kind in Britain, was opened recently at Sundridge Park, Kent. Three-week courses will be held at regular intervals. They have been planned in consultation with a special advisory panel set up for the purpose by the Federation of British Industries, and are intended for managing directors, export directors and all senior sales executives concerned with the promotion of export business. All the main factors affecting export policy and marketing procedures in present world conditions will be studied, and the principles and techniques discussed will apply equally to large and small organisations, irrespective of the type of product manufactured.

Gauge and Tool Makers' Luncheon

The guest of honour and chief speaker at the next trade luncheon of the Gauge and Tool Makers' Association, to be held at the Savoy Hotel, London, on 3rd October, will be Mr. Edward Heath, the Lord Privy Seal, who will give an address on the European Common Market.

SOLAR CELL DEVELOPMENT

AT the Caswell Research Laboratories of the Plessey Co., Ltd., silicon photovoltaic cells are being developed which under ideal load conditions have a conversion efficiency up to 12½ per cent. Two basic manufacturing configurations are being examined, the diffusion of phosphorus and the diffusion of boron. Contacts are made to the surfaces on either side of the junction and techniques are being developed to ensure that the internal resistance is kept at a low level. Since an increase in the ambient temperature decreases the conversion efficiency, some method of stabilising the temperature of the cells must be used for space satellite applications. A current method is to coat the surface of the cells with selective transmitting or reflective coatings so that only useful radiant energy is absorbed by the cell.

In addition to providing power, such cells may be used in a device to detect the impact on satellites of very small meteorites or micrometeorites encountered in space. Sunlight passing through holes made in a thin metallic film by the micrometeorites will fall on solar cells and signals from the cells will indicate the number and size of the holes. It is anticipated that this device will be able to detect holes formed by particles down to 0·000001in in diameter.

SATELLITE COMMUNICATION

The G.P.O. is to participate in tests of a new communications satellite known as project TSX. The satellite is to be launched by the U.S. National Aeronautics and Space Administration early in 1962. Transmission of television signals and multi-channel telephony between Maine, U.S.A., and the G.P.O. ground station at the Lizard, Cornwall, will form part of the tests.

B.E.A.B. to Consider Refrigerators

Manufacturers of domestic refrigerators may now apply for B.E.A.B. approval based on the safety requirements of B.S. 1691 which are being re-issued as a B.S. 3456 section and cover safety, durability and reliability in service. It is hoped that the simultaneous announcement of successful applications will be made on 15th December. In order to qualify for inclusion in this initial announcement, manufacturers should return completed applications by 4th October.

The British Electrical Approvals Board for Domestic Appliances has been seeking new office accommodation and from 24th September the address will be "Mark House," 153, London Road, Kingston-upon-Thames, Surrey. Any manufacturer requiring further information about the approval scheme should write to the director, Mr. C. A. Zweigbergk.

JOINT CONSULTATION

APART from its larger size and more attractive layout, the interest of the 12th annual report 1960-61 of the National Joint Advisory Council for the Electricity Supply Industry is enhanced by the naming, for the first time, of the councils and committees whose work is described. As in previous years the report not only makes an overall assessment of the work of the advisory machinery at all levels, but also describes in greater detail examples of the work of the twelve district joint advisory councils and the 468 local advisory councils in England and Wales.

Commenting on the innovation of the holding of informal departmental meetings associated with a number of local advisory committees the report says that "this marks what may prove to be a most important development in consultation in this industry." The aim is to bridge the gap between the L.A.C. and the individual employee. This development, although found in several sections of the industry, is most marked in the power stations of the North Eastern Region. Here, with the support of the Yorkshire and North Eastern district joint advisory councils, and with the active encouragement of the regional director, there are now regular meetings of the natural "working groups" of employees under the chairmanship, usually, of their departmental head. Welfare and amenity problems sometimes predominated at early meetings, but have now usually given way to discussion on work problems.

Although the general impression is one of steady advance in local committee work the authors of the report are evidently well aware of the many obstacles to really successful consultation and in particular they do not hesitate to discuss the situation which has prevented local committees meeting regularly at some power stations in the London area.

Projector Lamp Code

The first edition of I.E.C. Publication 128, "International Code for the Designation of Photographic Projector Lamps," which has just been issued, describes a coding system for the designation of photographic projector lamps according to their characteristics which affect interchangeability. The purpose of the code is to provide an internationally applicable and convenient lamp identification symbol which may be used for both manufacturing and ordering purposes. Details of a scheme set up by the International Electrotechnical Commission whereby manufacturers may obtain codes for their lamps are given in the publication, which is obtainable from the British Standards Institution, 2, Park Street, London, W.1, price 13s 6d, plus 6d postage.

WHOLESALERS' SCOTTISH MEETING

The annual function of the Scottish Section of the Electrical Wholesalers Federation is to be held at the Marine Hotel, North Berwick, from Tuesday to Friday, 3rd to 6th October. The Council of the Federation will hold a meeting on the Wednesday morning at which it will be joined by the Scottish members. A golf competition has been organised for those interested, and various other informal relaxations will be available. A dinner will be held on 5th October.

Ionising Radiation Hazards

SIX orders made by the Minister of Labour under the Ionising Radiations (Sealed Sources) Regulations, 1961, have been published by H.M. Stationery Office, price 3d each. They are the Ionising Radiations (Sealed Sources) (Radiation Dosemeter and Dose Rate Meter) Order, 1961, S.I. 1961, No. 1710; Leakage Test Order, 1961, S.I. 1961, No. 1711; Laboratory Certificate Order, 1961, S.I. No. 1712; Radiation Dose Record Order, 1961, S.I. 1961, No. 1713; Health Register Order, 1961, S.I. No. 1714; and Transfer Record Order, 1961, S.I. No. 1715.

These Orders, which come into force on 1st February, 1962, prescribe the particulars to be kept of maximum permissible radiation doses and of doses received by each worker designated as a "classified worker" under the Regulations, of medical examinations of such workers, and of tests of instruments used to check radiation levels. The method of testing a sealed source for leakage is stipulated and the level of leakage is laid down at which such a source must be taken out of use until it has been repaired. The form of the record which an employer must give to a worker leaving his employment is stipulated, as are the particulars which are to be included in certificates of results of examination of photographic films worn by workers to measure any exposure to ionising radiations. Forms, including explanatory notes, will be available later in the year for recording the particulars kept under the Orders.

HIGHER PATENT FEES

Under the Patents (Amendment No. 2) Rules, 1961, the fee payable on filing a complete specification for a patent application is to be raised from £4 to £10 as from 1st October.

SALISBURY CATHEDRAL LIGHTING

New lighting has been installed in the Choir and Lady Chapel of Salisbury Cathedral using concealed lamps mounted high up at triforium level. Inset (top left) is shown a group of three A.E.I. reflector floodlights sited on one of the main supporting columns

Contract Price Formulae

THE British Electrical and Allied Manufacturers' Association has issued the figures for its contract price adjustment formulæ. The rate of pay for adult male labour effective since 26th December is deemed to be 213s 6d. The "costs of materials" figures are: For electrical machinery and equipment the Board of Trade index figures published on 15th September are 184·6 (1949=100) and 119·0 (1954=100); both figures are provisional. For turbo-generating and allied plant: Materials used in mechanical engineering industries 193·5 (1949=100) and 128·8 (1954=100); both figures are provisional. Blast furnaces and iron and steel melting and rolling (1948 S.I.C. Ref. 40/41) 191·5 (1949=100) and other steel goods, excluding tubes (1958 S.I.C.), 130·5 (1954=100). The price of $\frac{3}{4}$in o/d 18 s.w.g. brass condenser tubes (*Metal Bulletin*, 15th September) was 49$\frac{3}{4}$d/lb.

Nickel and Beryllium Strip

Sample quantities of "Nilo K" nickel alloy strip clad on each side with 0·5 per cent gold-antimony are available from Johnson, Matthey & Co., Ltd., 73-83, Hatton Garden, London, E.C.1. The strip is available in widths between $\frac{3}{32}$in (2·4 mm) and 2in (50·8 mm), in thicknesses down to 0·005in (0·13 mm). The thickness of cladding that can be supplied on each face is either 11·5 per cent or 18·75 per cent of the total thickness. The company also announces that all Mallory 73 beryllium copper strip up to 0·025in thick will be supplied with beryllia-free surfaces. Excessive tool wear is attributable to the presence of beryllia, a hard and abrasive oxide of beryllium that is formed during the solution heat treatment of the alloy. The oxide is colourless and is not removed by normal cleaning or pickling methods, so that it is often present on material that appears to have a good surface finish. A new process removes beryllia, and the improved material is supplied at no extra cost.

E.C.A. Events

The annual dinner of the Electrical Contractors' Association is to be held at Grosvenor House, London, W.1, on 13th February next. Tickets will cost £2 2s each.

Next year's E.C.A. Conference will take place at Eastbourne beginning on 17th May.

FROST PREVENTION ON CAR PARK RAMPS

G.E.C. heating system being installed in the ramps at the new factory of Vanson Furniture, Ltd.

TO permit the parking of cars on the flat roof, the new factory of Vanson Furniture, Ltd., Park Royal, N.W.10, has external ramps. These are at a gradient of approximately one in six, and in winter conditions would be hazardous. Following a series of tests and experiments by the Lighting and Heating Group of the General Electric Co., Ltd., the prospective danger was overcome by embedding specially designed road heating mats in the concrete sub-surface of the ramps. Each mat is constructed from panels of 4$\frac{1}{2}$in mesh expanded steel, with both ends having a 1$\frac{1}{2}$in by $\frac{1}{4}$in mild steel flat bar butt welded on edge across the long way of the mesh and projecting 2in on the same side, to act as a connecting busbar to low voltage transformers. Loading of the mats is 12 W/sq ft, thermostatically controlled to switch on at 30°F. The electrical work was carried out by the Service Electric Co.

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 13th October.

Turnamat. No. 818,818. Class 7. Washing machines.—Allgemeine Elektricitats-Gesellschaft, Germany. Address for service: Matthews, Haddan & Co., 31-32, Bedford Street, Strand, London, W.C.2.

Tudormatic. No. 821,121. Class 7. Electric machines for domestic use.—Tudormatic (Domestic Appliances), Ltd., 8-10, Mathew Street, Liverpool.

Quersa. No. 821,171. Class 7. Portable power-operated hand tools.—S.P. Mercantile, Ltd., 39-47, East Road, London, N.1.

hp in circle. No. B778,021. Class 9. Electronic measuring, counting, recording, and testing apparatus and instruments.—Hewlett-Packard Company, U.S.A. Address for service: A. M. & Wm. Clark, 5, Quality Court, Chancery Lane, London, W.C.2.

Figure design and **RS.** No. 808,853. Class 9. Radio, television, communication, radar and testing apparatus, computers, electrical and electronic control apparatus, etc.—Radiospares, Ltd., 4-8, Maple Street, London, W.1.

Autoclor. No. B810,203. Class 9. Electrical devices for automatically measuring and dispensing predetermined quantities of chemical substances into water feed pipes.—Gilliam & Co., Ltd., 902, Purley Way, Purley, Surrey.

Ray-O-Vac (design). Nos. 811,733 and 811,735. Electric dry cells, dry cell batteries and cases for electric pocket lamps and for torches. Nos. 811,734 and 811,736. Electric torches.—Electric Storage Battery Company, U.S.A. Address for service: Gill, Jennings & Every, 51/52, Chancery Lane, London, W.C.2.

Minicube. No. 809,277. Class 9. Electric blowers.—Sanders Associates, Inc., U.S.A. Address for service: Stevens, Langner, Parry & Rollinson, 5-9, Quality Court, Chancery Lane, London, W.C.2.

Symbolic design. No. B816,413. Class 9. Electrical capacitors.—Electronic Instruments, Ltd., Lower Mortlake Road, Richmond, Surrey.

Forksichord. No. 819,619. Class 9. Electrical instruments for testing vibratory frequencies.—Westrex Co., Ltd., 152, Coles Green Road, Cricklewood, London, N.W.2.

Brigand. No. 820,782. Class 9. Batteries, cells, accumulators, radio receivers, television apparatus, etc.—Berec Radio, Ltd., Hercules Place, Holloway, London, N.7.

Stratacon. No. 821,051. Class 9. Electrical and electronic apparatus.—Painton & Co., Ltd., Bembridge Drive, Kingsthorpe, Northampton.

Panfax No. 821,417. Class 9. Scientific and electrical apparatus and instruments.—Racal Engineering, Ltd., Western Road, Bracknell, Berks.

Climatronic. No. 821,624. Class 9. Electrical regulating apparatus for automatically controlling temperature, the operation of burners and heaters, and the supply of fuel to fuel combustion apparatus.—Rheostatic Co., Ltd., 94, Farnham Road, Slough, Bucks.

Globe. No. 791,140. Class 11. Electric clothes-drying cabinets.—Charles E. Cox (Globe), Ltd., Globe Works, Mill Street, Burnley.

Prismalipse. No. 817,129. Class 11. Electric light fittings.—Loblite, Ltd., Third Avenue, Team Valley, Gateshead-on-Tyne.

Duchess (design). No. 821,092. Class 11. Hair drying appliances (not machines).—Mitcham Manufacturing Co., Ltd., 192-194, Kensington Church Street, London, W.1.

Luxiwarm. No. 822,725. Class 11. Electrical heating appliances and installations.—Herbert Smith, 3, The Quadrant, Romiley.

NEW ELECTRICAL EQUIPMENT

TRANSISTORISED TIMER UNIT

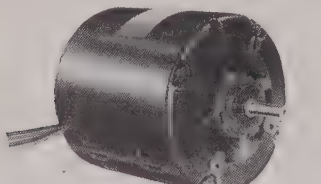
An electronic interval timer for opening and closing relays at predetermined time intervals announced by B. & R. RELAYS, LTD., Temple Fields, Harlow, Essex, is capable of operating between 12 and 50 V d.c. with a maximum time delay of 3 min. It has a repeat accuracy of ±10 per cent. Ambient operating temperatures are between -15 and $+60$°C. It is fitted with single-pole change-over contacts. It weighs 1 lb 12 oz and is $4\frac{1}{2}$in square by $2\frac{1}{8}$in high excluding the time adjustment control knob.

SMALL MOTORS

A range of f.h.p. motors which comply with the requirements of B.S. 170 and have the mounting dimensions of the American standard N.E.M.A. 42 have been introduced by CROMPTON PARKINSON, LTD., Crompton House, Aldwych, London, W.C.2. There are four main types: shaded pole, capacitor start induction run, capacitor start and run, and split-phase start. These are all available with drip-proof enclosure, and, in addition, the shaded pole motor can be supplied as totally-enclosed air-stream and totally-enclosed still air rated. The motors with resilient base have a centre height of $2\frac{5}{8}$in. To comply with N.E.M.A. standards, the motors have a $\frac{3}{8}$in diameter shaft extension. Bearings, however, allow for $\frac{1}{2}$in diameter shafts to be provided at either end of the machine for small extra cost. The split-phase and capacitor start induction run motors employ a starting relay which is separately mounted. Capacitors for capacitor start induction run and capacitor start and run motors are also separately mounted. Polyvinyl acetyl resin is used to insulate stator windings. The T.30 range is available for single-phase working from 1/40 h.p. at 1,350 r.p.m. as a shaded pole totally-enclosed still air motor, up to $\frac{1}{8}$ h.p. at 1,425 r.p.m. as a drip-proof split phase or capacitor motor.

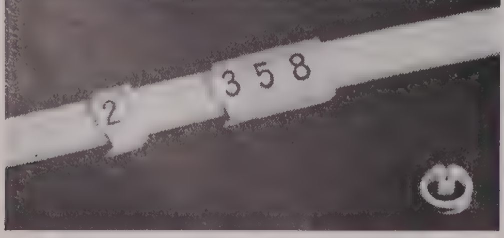
PORTABLE INSTRUMENTS

The introduction of a range of Bach-Simpson precision portable instruments is announced by AVELEY ELECTRIC, LTD., Ayron Road, Aveley Industrial Estate, South Ockendon, Essex. Ammeters, milliammeters, voltmeters and millivoltmeters are available for d.c. and a.c. operation in several ranges, but combinations of current and voltage cannot be supplied in one instrument. For d.c. types the accuracy is 0·5 per cent full-scale deflection with correction curves of 0·2 per cent or better and an accuracy of 0·75 per cent f.s.d. with correction curves of 0·3 per cent or better is obtainable with a.c. types.

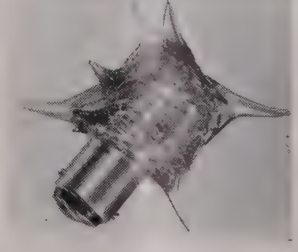


Crompton Parkinson f.h.p. motor

Right: Bach-Simpson portable voltmeter available from Aveley Electric, Ltd.



Hellermann interlocking cable identification sleeves



Courtney, Pope "Satellite" display lamp

DISPLAY LIGHTING LAMPS

A range of 10 W, 240 V lamps has been produced by COURTNEY, POPE (ELECTRICAL), LTD., Amhurst Park Works, Tottenham, London, N.15. Known as "Satellite" lamps, they are supplied in seven colours and the coloured glass bulbs are finished with "spikes" which give the lamps the appearance of twinkling stars and provide an attractive display effect. The colours in the range are crystal, red, blue, amber, green, amethyst and pink. The price is 11s $9\frac{1}{2}$d per lamp, including purchase tax.

IDENTIFICATION SLEEVES

The range of identification sleeves manufactured by HELLERMANN, LTD., Gatwick Road, Crawley, Sussex, has been extended by the addition of "Helagrip" flexible p.v.c. sleeves designed for fitting without the aid of tools. These are supplied in sizes covering cable diameters of $\frac{1}{8}$in to $\frac{7}{16}$in, and are interlocking and remain in position even when cables are turned through 90°. This feature ensures alignment of characters and facilitates fitting. The sleeving is supplied in a standard colour of white with black printing and coded A to Z and 0 to 9. It is supplied in strip form, partially cut to ensure correct positioning of the marker.

POLYSTYRENE-CASED CELL

The Exide 2 V cell developed by CHLORIDE BATTERIES, LTD., of Exide Works, Clifton Junction, Manchester, is suitable for intermittent and standby duties such as burglar and fire alarms and clock systems, and other applications where maintenance is under floating or trickle charge conditions. Known as the type DTP, the new cell comprises one positive and one nega-

Sealectro threaded p.t.f.e. terminal

tive mass type plate, assembled in a white polystyrene container with ribs moulded in the bottom to hold the plates in position without separators. The black polystyrene lid is permanently cemented to the container and the polystyrene vent plug fits flush with the top of the lid. Terminal assembly is of nickel-plated brass screws with coin slots for easy manipulation. The capacity at the 1,000 hr rate is 20 Ah, at the 100 hr rate 12 Ah, and at the 20 hr rate 7 Ah. It measures $2\frac{5}{16}$in long by $2\frac{7}{8}$in wide by $5\frac{1}{2}$in high and weighs 2 lb 3 oz filled and charged. The list price uncharged is 14s 6d.

A.C. OPERATED COUNTER

The predetermining counter manufactured by the STONEBRIDGE ELECTRICAL CO., LTD., 6, Queen Anne's Gate, London, S.W.1, is now available in a flush mounting case with a built-in rectifier unit and can be operated from a 230/240 V a.c. supply. The counter is first set by turning toothed drums under a hinged flap until the required number is indicated on the scale. It then counts backwards to zero, when a changeover contact is made. The counting rate is up to 25 impulses/sec. A separate relay unit has also been designed for use with this counter when automatic resetting is needed after the zero count has been reached. This relay unit ensures that the reset coil is energised for a sufficiently long period and that counting impulses cannot be received until resetting is completed. Additional contacts on the relay also allow the number of resetting cycles to be indicated on another counter if required.

THREADED P.T.F.E. TERMINAL

A threaded terminal is now available from the SEALECTRO CORPORATION, Hersham Factory Estate, Walton-on-Thames, Surrey. This "Press-Fit" type FT-500 TI unit has a screwdriver slot milled across the threaded stud to facilitate holding the mounted terminal while high torque may be applied to the terminal nut. Overall length of the terminal is 0·743in. A metal shoulder provides the stop for the tightening nut and maintains a high dielectric strength path from the chassis. Mounting bushing diameter is 0·171in. The brass stud may be silver or gold plated and the p.t.f.e. body is available in any standard colour. The below-chassis stud is 0·070in in diameter.

PHOTOELECTRIC MONITOR

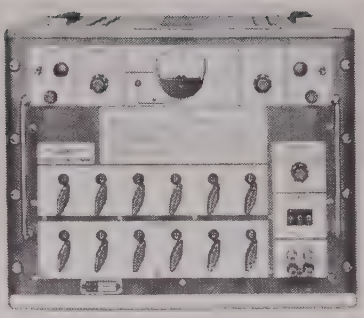
A combined photocell and lamp unit suitable for use in confined spaces is now being manufactured by HIRD-BROWN, LTD., 244, Marsland Road, Sale, Cheshire. The unit, designated type TPR1, is suitable for monitoring on the edges of materials, discs or any thin moving objects. It is $2\frac{3}{8}$in long by $\frac{3}{4}$in wide by $1\frac{3}{4}$in deep and the photocell measures $\frac{3}{4}$in by $\frac{1}{4}$in by $1\frac{3}{8}$in. Two fixing holes of $\frac{1}{8}$in diameter are provided and there are also two 5ft lengths of twin p.v.c. cable for connection to the control equipment. Both the bulb and the photocell can be changed without dismounting the unit. The bulb is rated at 6·5 V. This equipment is also available in two separate units—a projector and a receiver—suitable for a beam of up to 1in long.

ULTRASONIC CONTROL EQUIPMENT

The range of Perram industrial control equipment manufactured by TYER & CO., LTD., Perram Works, Merrow Siding, Guildford, Surrey, has now been extended to include an ultrasonic equipment which can be used in a similar manner to their photo-electric units. The sound frequency used is in the region of 45 kc/s, and the wavelength is approximately $\frac{1}{3}$in. Provision is made within the unit to eliminate spurious operation from other sounds. The maximum beam length is 25ft. The equipment is completely transistorised, and is normally suitable for operation from either 12 V d.c. or 200/250 V mains supply, but other voltages can be catered for.

VARIABLE PHASE STANDARD

A variable phase standard which allows the phase between two self-generated voltages to be shifted to any desired angle with a minimum accuracy of ±0·05° is now available from the WAYNE KERR LABORATORIES, LTD., 44, Coombe Road, New Malden, Surrey.



Wayne Kerr-Gertsch variable phase standard

Operating over three adjustable frequency ranges between 150 and 3,000 c/s, this instrument (designated VPS-1) generates two voltages of equal amplitude differing in phase by any angle from 0° to 360°. The reference voltage has a fixed amplitude of 50 V r.m.s. whilst the vector output, which may be displaced in phase in increments of one minute of arc, has a maximum amplitude of 50 V r.m.s. and can be attenuated in 50 mV steps.

CATHODE RAY TUBE

A double-gun helical p.d.a. cathode ray tube has been added to the range manufactured by the M-O VALVE CO., LTD., Brook Green, London, W.6. It is a 10 cm diameter tube, type 1,000F, for use in general purpose oscilloscopes in which two independent signals are displayed on a common time base. Deflection sensitivity in the x direction is 24 V/cm and in the y direction 14 V/cm with a gun voltage of 1·2 kV and a final anode potential of 4 kV. The line width is approximately 0·4 mm. The two guns scan a common window 6·3 cm square. Side pin connections to the deflector plates contribute to low input capacitance. The overall length, excluding base pins, is 34·8 cm ±0·5 cm.

DECORATIVE LAMPS

Two lamps, the "X" and the "XX," announced by ASCOT LAMPS & LIGHTING, LTD., Arcola Street, Dalston, London, E.8, are intended to be complete fittings in themselves and require no shades or globes, being suitable for high ceilings and other difficult-access situations. An evenly translucent surface has been attained by a process in which the inner surface is coated with titanium dioxide. The lamps are gas filled and have

Ascot decorative lamp

a guaranteed life of 2,000 hours. The prices are: Ascot "X"—150 W, 12s 6d each, and Ascot "XX"—200 W, 17s 1d each, both including purchase tax. Lamps are available for 240/250 V operation.

TRAVEL IRON

The latest addition to the range of electrical products manufactured by Pifco, Ltd., Watling Street, Manchester, 4, is a travel iron designed for use anywhere in Great Britain or the Continent.

It is a dual-voltage model—200/250 or 100/120 V a.c. or d.c.—the voltage selection switches being instantly adjustable. The loading of the element is 200 W. The iron is chromium plated and has a black moulded handle which folds flat for packing.

It is provided with 9ft of flexible and a connector and the complete unit, in its grained plastic case, weighs approximately $2\frac{3}{4}$ lb. The price is £2 13s 3d plus 10s 9d purchase tax.

Pifco travel iron

Fluorescent Lighting Fittings

NEW industrial, commercial and decorative fluorescent lighting fittings, to be known as the "Durham" range, are announced by Ekco-Ensign Electric, Ltd., 45, Essex Street, Strand, London, W.C.2.

The fittings are based on standard single- or twin-lamp spines, complete with built-in control gear and lampholders, ready wired. Each type is available in 4, 5 and 8ft versions, with "Quickstart" or "Switchstart" control gear. The materials used are of the same quality as those in the company's "Essex" range. The same channel sections are used for all fittings, whether single- or twin-lamp. All spines have flat vertical ends and have only two suspension holes.

With this range Ekco have also introduced new lampholder assemblies. The bi-pin lampholders are of the type which completely encloses the lamp cap. They are unusual in that they are attached to the fitting by substantial flat strip springs, and consequently the whole lampholder is sprung.

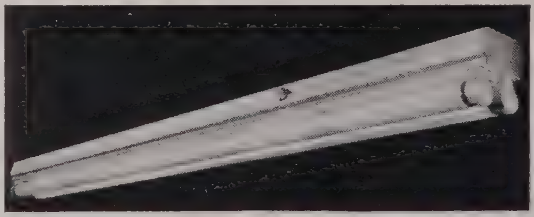
Ample movement at the lampholders makes re-lamping easy, and it has been possible to use a spring which holds the lamp positively, providing adequate pressure at the electrical contacts.

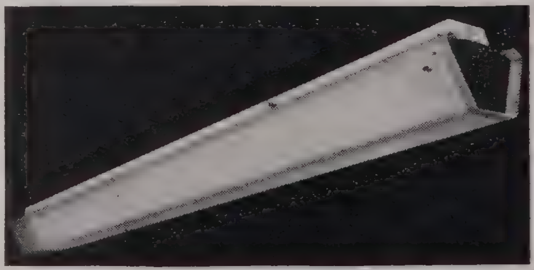
The hard phosphor bronze spring assemblies normally used within good quality lampholders have been replaced by simple contacts, consequently there is a lower millivolt drop in the circuit which is of assistance to starting. They are only available on fittings in the "Durham" range.

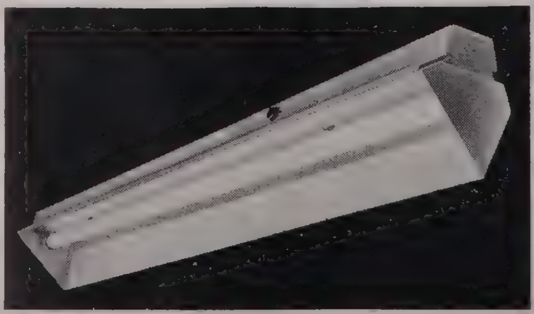
The control gear and components of the fittings comply with the appropriate British Standard and "Permaset" fixed voltage chokes are fitted as standard. The starter switches are mounted in the sides of the spines where they are immediately accessible. Another feature of the "Durham" range is its flexibility—fittings *in situ* may be rapidly converted, e.g. from plain batten or reflector to totally enclosed diffuser.

Cover plates, reflectors and diffuser suspension plates are interchangeable. They may be attached by means of two screws on the spine which engage in key-hole slots and are then tightened. Diffusers are attached by a simple system of hooked lips. The catalogue on the new range contains the BZ classification and lighting performance data for each fitting, so that installations may be planned in accordance with the recently published "I.E.S. Code Recommendations for Good Interior Lighting 1961."

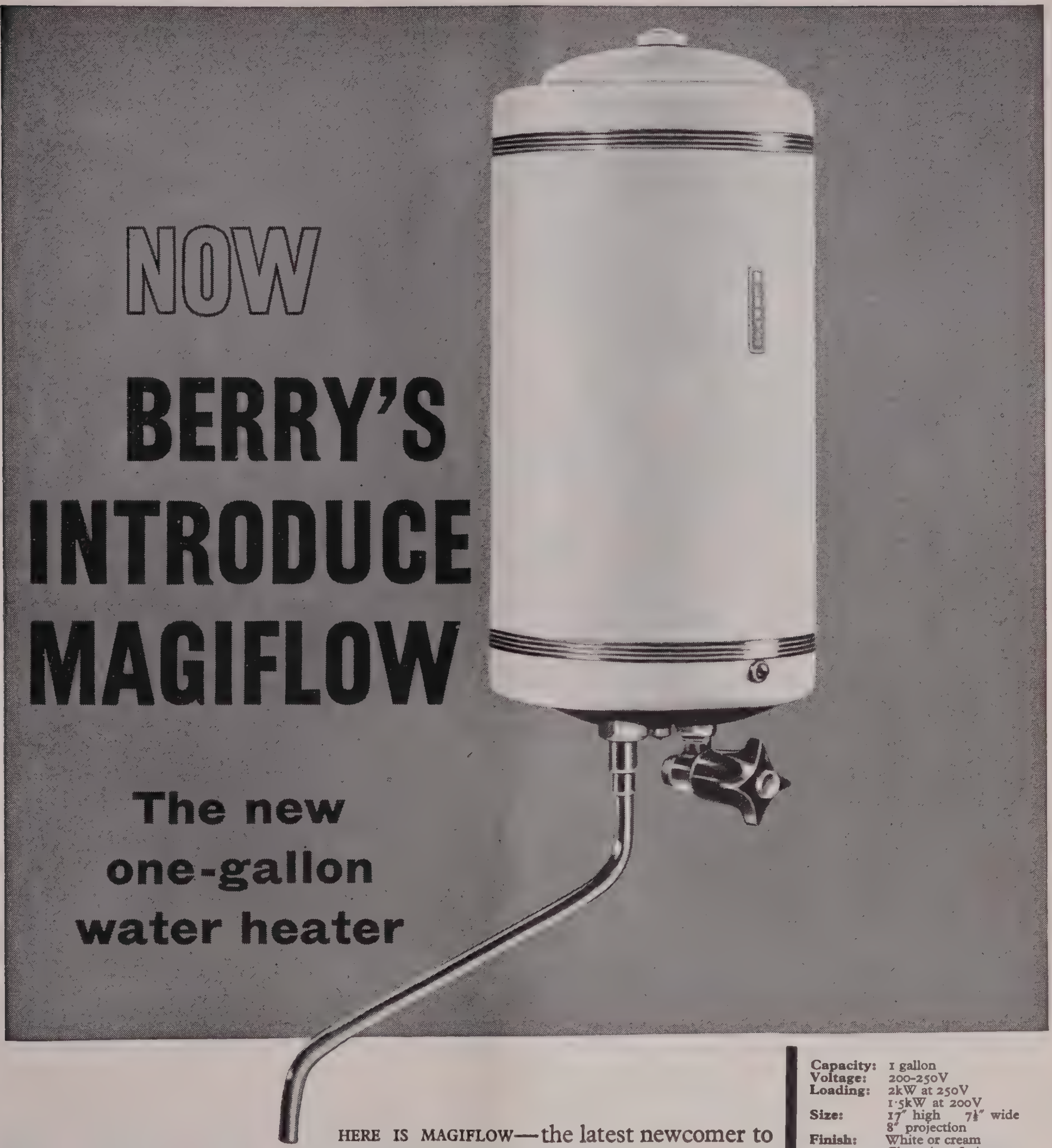
The prices for fittings with "Switchstart" circuits range from £4 for a 40 W 4ft batten fitting (single-tube) to £14 for a 125 W 8ft angle reflector fitting (twin-tube). Lighting fittings with "Quickstart" circuits cost slightly more. A full price list is obtainable from the company upon application.







Three of the new fluorescent fittings from the Ekco "Durham" range. Top: Twin-tube 5ft batten fitting. Centre: Totally enclosed 5ft twin-tube diffuser fitting. Bottom: 5ft angle reflector fitting



HERE IS MAGIFLOW—the latest newcomer to Berry's famous 'Magi' range of electrical appliances.

Trim good looks and top efficiency make the Magiflow the water heater more and more people are going to ask for. Its sleek design takes up less than a square foot of wall space—yet Magiflow can supply more than enough piping hot water for any average family, thanks to its exceptionally quick recovery.

First-class insulation and "magic eye" thermostatic control cut running costs to the absolute minimum. Check all the Magiflow's features and see why *this* is the water heater you should recommend.

Capacity:	1 gallon
Voltage:	200-250V
Loading:	2kW at 250V 1·5kW at 200V
Size:	17" high 7½" wide 8" projection
Finish:	White or cream Chromium fittings Black, easy-to-clean, toughened plastic tap

£10.16.6 plus P.T. £2.6.5

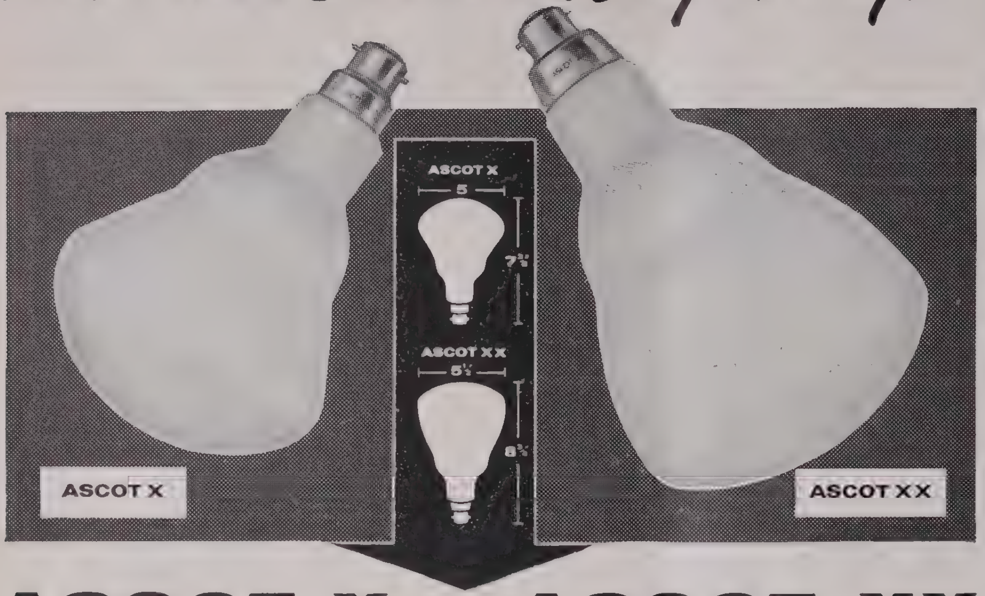
PRICE: £13.2.11

Berry's

BERRY'S ELECTRIC MAGICOAL LTD

Water Heater Division · Touchbutton House · Newman Street · London · W.1 Tel: MUSeum 6800

The New Look in Lighting!



ASCOT X & ASCOT XX

EACH LAMP A COMPLETE LIGHT FITTING IN ITSELF!

These new-shape lamps outdate all light-obscuring, dust-collecting globes. They save the cost of shades or globes and reduce time and money spent on cleaning. **Every Ascot X or XX lamp is coated internally with titanium di-oxide made to Patent No. 737861 for extra brilliance and durability,** and guarantees 2,000 hours of the best diffused illumination. For domestic, commercial or public premises, in Entrance Halls, Canteens, Kitchens, Bathrooms, Workrooms, etc.

** Prices: Ascot X (150 watts)* **12/6**, *inc. tax. Ascot XX (200 watts)* **17/1**, *inc. tax. Voltages 240/250.*

OTHER HIGHLIGHTS OF THE EXTENSIVE ASCOT RANGE

DIPLOMAT

The new compact-shape lamp, with special Ascot internal titanium di-oxide coating made to Patent No. 737861, for extra brilliance and durability.

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Designed to give up to twice the life of ordinary lamps. All Ascot lamps are twice-in-24-hours-tested for complete reliability.

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61 UNIVERSITY SCHOLARSHIPS offered by Electricity Supply

61 university scholarships are offered this year by the Electricity Supply Industry of England and Wales to sixth-formers wishing to read for degrees in science and engineering.

Each scholarship is worth up to £375 a year, plus full fees.

36 scholarships, all in electrical engineering, are offered by the 12 Area Electricity Boards. 25 scholarships, in a wide range of science and engineering subjects, are offered by the Central Electricity Generating Board.

All scholars will be offered, after graduation, practical training or staff posts in this essential, rapidly expanding industry.

Full details and application forms have been sent to the Head Teachers of Grammar and Public Schools throughout Great Britain. Additional copies, and further information, may be obtained from:

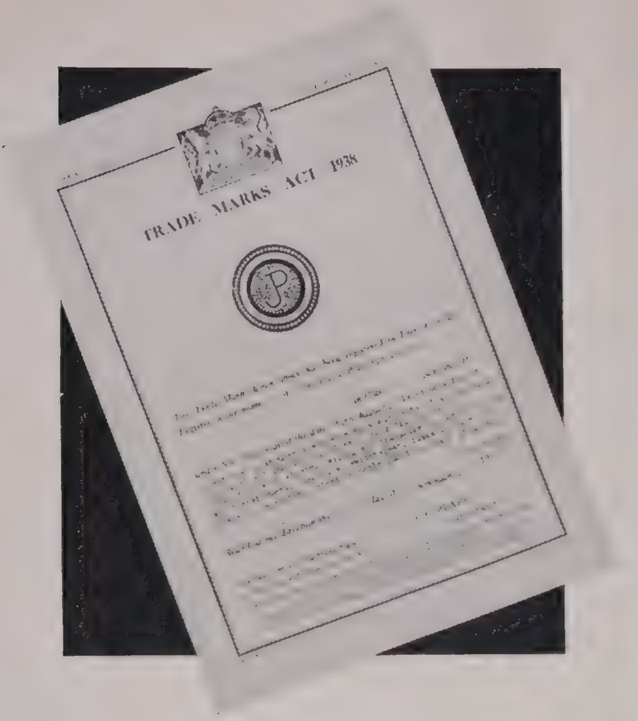
The Education and Training Officer,
The Electricity Council, 12 Winsley Street,
London, W.1.

17758/2

British Trade Marks Procedure

By S. AUSTEN STIGANT

M.I.E.E., Fellow A.I.E.E.



TRADE MARKS ACT 1938

This article supplements that on "British Patents Procedure" published in the 23rd December, 1960, issue of the *Electrical Review* and provides comparable guidance on registered trade marks, where this is possible. In addition, information is given that relates more particularly to trade marks, although as may be expected, there is a certain community of formal requirement in respect of both types of protection. A third article is to be published later dealing with design registration

AN application for registration of a trade mark at the Patent Office may be filed by (a) the owners of a mark or (b) an agent on behalf of the owners. The owners may be one or more individuals in conjunction, a firm or partnership, or a corporate body. In the case of individual owners the full names and addresses of all the applicants must be stated; for firms or partnerships the full names of all the partners and the business address should be given and the application signed by a partner of the firm; for corporate bodies the application form should be signed by a director, secretary or other authorised official of the company, and the company's address should be given together with a brief description of its business.

In the case of an application dealt with by an agent, the agent must be authorised (on an official form) by the owners and the authority should be signed and otherwise dealt with as in a form of application.

Prior Publication

Unlike the case of an invention to be patented, a trade mark (if otherwise acceptable) can be registered at any time after publication and, indeed, even after having been used unregistered for any number of years. When an unused mark is clearly not registrable it is invariably used unregistered for some years after which registration may then be obtainable on the basis of that use. In such circumstances the owner of the mark must submit, with his application, a representative number of certified documents from individuals, firms or corporate bodies familiar with the mark in the country concerned, recording their familiarity over a specified period and stating that they have always associated the mark only with the name of the applicant and with the particular product or products with which the mark is now formally to be associated.

Documents to be Filed

Again, unlike a patent application, no written specification accompanies an application for registration of a trade mark. In fact, the illustration or representation of the mark is its own complete "specification" and no other description is necessary. Five copies of the mark are required, one on the official application form itself and four additional copies. These are necessary for each class of goods in which registration is sought, except in the case of textile marks when two official application forms and six additional representations are required.

Classes of Goods

In Schedule IV of the Trade Marks Rules of 1938, 34 different classes are listed for the purposes of trade mark registration. Each class contains a range of associated goods as, for example, "No. 11, Installations for lighting, heating, steam generation, cooking, refrigerating, drying, ventilating, water supply and sanitary purposes." It is often important to register in several classes and the agent's advice should be sought on this matter.

Completion of Registration

A period of 12 months from the date of application is normally allowed for completing the registration, but this may be extended by the Registrar at his discretion and according to circumstances. It is within this period that the Examiner institutes an official search to ensure that (a) the mark is basically acceptable and (b) that the same or a similar mark has not previously been registered. If the Examiner finds any prior registration which he considers anticipates, in one way or another, the mark being considered, he notifies the applicant who may then argue that there is no anticipation or may modify the mark or goods to meet the objection. When the Examiner is satisfied that no objection exists, or no longer exists, the application is accepted.

There is no fixed lapse of time between the date of filing the application and the acceptance date, but normally this must not be longer than 12 months. The time period depends upon the amount of work the Patent Office has in hand at the time, and the sort of objection raised. Up to the acceptance stage the name of the applicant for registration of the trade mark has remained secret.

Upon acceptance the Patent Office then advertises the mark in the *Trade Marks Journal* and it is open to opposition for one month or such further extension as the Registrar may allow.

Inspection and Opposition

Following advertisement of the mark in the *Trade Marks Journal,* opposition to registration may be filed at the Patent Office by any interested party during the month subsequent thereto or during any extension to that period that may be allowed by the Registrar. The latter then notifies the applicant of the substance of any objection that may be lodged and this must either be refuted by him to the satisfaction of the Registrar or else accepted. The opposer, however, should first notify the applicant of the objection to enable him to withdraw the application rather than to take the case to official opposition as the opposer may then be entitled to costs if successful. After written arguments by the applicant and opponent, the opposition is argued verbally before the Registrar or one of his officers at a hearing fixed by the Registrar, at which time the fate of the application will be decided.

A trade mark may be referred to as " registered " only after the mark has been entered on the official register and a certificate of registration issued by the Registrar. Prior thereto an applicant may use words such as " registration applied for " or simply the words " Trade Mark."

Granting of Registration

Registration is granted to the applicant if no opposition to the officially advertised mark is filed during the opposition period. If opposition is filed, final granting becomes delayed until the Registrar is satisfied with the outcome of the objection. Upon notification that the application is finally in order and may proceed to registration, the registration fee must be paid to the Registrar who will then have the mark entered on the register and a formal certificate of registration issued to the applicant. If the registration fee is not paid the application will lapse.

It is important to appreciate that an *application* for trade mark registration has no legal value until the mark has been entered on the register. Damages, however, may be sought for infringement taking place after the date of application as registration is retrospective to this date.

An applicant may be dissatisfied with the Registrar's final ruling on an issue, (a) at the stage of examination for acceptance and/or (b) arising from opposition proceedings. In case (a) the applicant may seek a hearing before a Hearing Officer in the Patent Office and if the decision of the Hearing Officer is still not accepted by the applicant he may appeal to the Board of Trade or to the High Court. In case (b) an appeal from the Registrar's final decision on the opposition may also be taken to the Board of Trade or to the High Court.

A registered trade mark may be revoked later if subsequently an aggrieved party can prove that the mark has been wrongly registered or not used for a continuous period of five years. Applications for revocation may be filed at any time except in the case of a Part A registration which is incontestable and unquestionably valid after seven years from its date of registration. Any registered trade mark may be revoked at any time on the ground of non-use.

In Great Britain a trade mark registration remains in force for seven years from the date of the original registration. It may then be renewed at the end of that period and of each subsequent 14-year period without limitation.

Convention Priority

This relates to foreign trade mark applications (based on a country-of-origin trade mark application) filed in any country that is a party to the International Convention for the Protection of Industrial Property, under the terms of which protection abroad with full priority can be obtained provided the application is filed in the foreign country within six months from the date of the first application in the country of origin. No extension of time beyond the allotted six months is permitted in respect of such foreign applications if the priority date is to be maintained. Foreign applications filed after the six months referred to lose the convention priority date but are not otherwise affected.

Filing Abroad

As a rule it is necessary to file abroad only where there is an export business. When and exactly where to file is a matter of economics for the cost of a single registration abroad is of the order of £30, but may even be much higher in some countries. It is, however, a good insurance to file applications in the important industrial countries of the world as soon as the British application has been registered. No annual renewal fees are payable for the foreign registrations and as these may last from seven to 20 years (with an average of ten years) according to the regulations in the country concerned, the cost over the period is not very heavy.

Some foreign countries (e.g. Germany) do not recognise " prior use," so that if a company trades and uses a mark in such countries for even some years *without* registration and another concern then chooses to register it, its use by the originator may well have to be discontinued.

Filing abroad is fraught with many pitfalls and it is essential to place all the facts before a patent or trade marks agent in order to secure the proper advice on the procedure to be followed. There is no " short answer " to this problem, every case being dealt with on its merits.

Searches

As a rule a patent or trade marks agent makes a search to establish the existence of prior registrations only when so requested by the applicant; he is not expected to do

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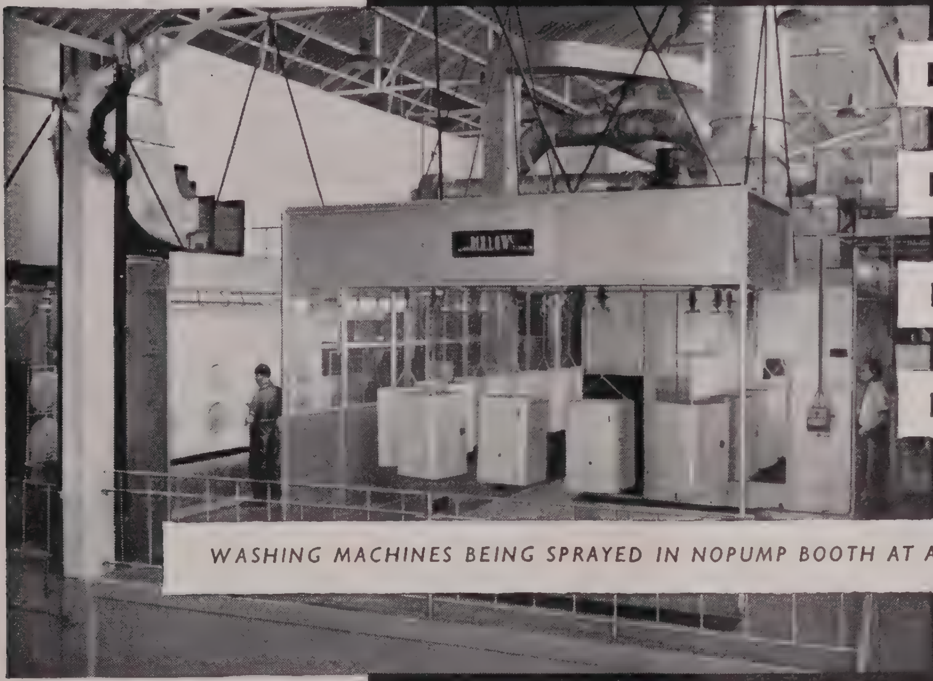
BULLOWS

NOPUMP SPRAY BOOTH

In this new type of Water-Wash Spray Booth the exhaust air travels at very high velocity over the water surface entraining water. The air/water mixture, moving through controlled changes of direction, provides the scrubbing action.



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1 kVA VOLTAGE STABILISER

TYPE
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FAST 40 volts/sec correction speed

ACCURATE Better than ±0·5%

RELIABLE Transistorised control unit — no valves or relays

The TS-1 is something entirely new in the field of A.C. voltage stabilsation. This light and compact 1 kVA unit provides rapid, accurate and distortionless stabilisation over an input voltage range of 25%. Alternative connection gives 2 kVA output with 12½% input range.

Output is unaffected by variations in supply frequency, load current (zero to full load) or load power factor. Indoor tropical rating is standard. Cabinet model (readily adaptable for wall or chassis mounting) or rack model.

PRICE—ONLY £69.10s. NET. Rack model £72. 5s. net

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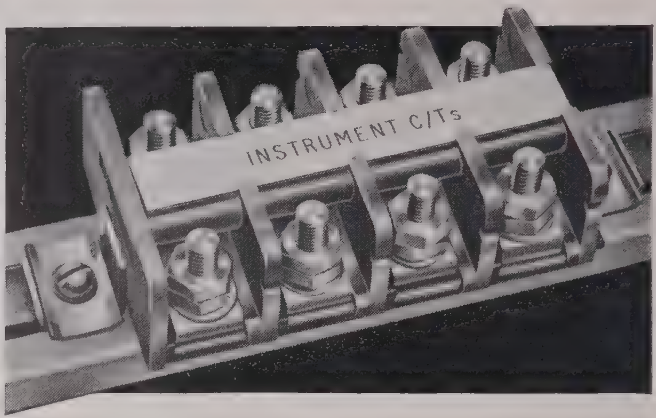
CL63/3A

BETA

TERMINAL BLOCKS

IN MOULDED NYLON



- Designed for simple and economical grouping of any number of ways.
- Extra ways can be added without dismantling or further drilling.
- Only two fixing screws required up to 12 ways.
- Transparent covers and name strips available.
- Carrying capacity 20 amperes.
- Tested to 4000 V. between terminals and to earth.
- Available with 0 B.A. and 2 B.A. studs.
- Moulded in NYLON, highly resistant to tracking and virtually unbreakable.

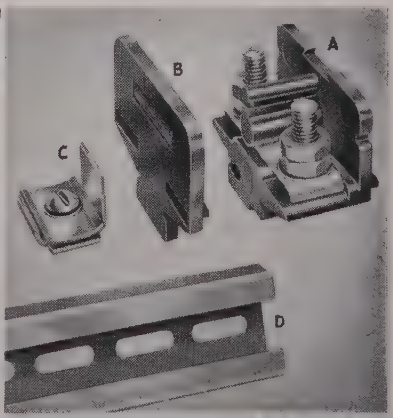
BASIC UNITS

A Body in moulded Nylon with brass connecting link with either 2 B.A. or O B.A. studs.

B Moulded Nylon barrier. Required only at one end of group.

C Cadmium plated steel end clamp, one required at each end of group.

D Cadmium plated slotted steel channel.



REF 1106

CRITCHLEY BROS · LTD

BRIMSCOMBE · STROUD · GLOS · Tel: BRIMSCOMBE 2208 (3 lines) this simply as a matter of course when an application is filed. As already indicated, the Registrar makes a search automatically as part of his duties when he comes to examine the application.

Definitions of Relevant Dates

Application Date. The date upon which the application with the representation of the mark is first filed at the Patent Office. It is the date which becomes the convention priority date when used as the basis for filing abroad.

Publication Date. The date upon which the Registrar publishes (or " advertises ") the mark in the *Trade Marks Journal.*

Opposition Period. The period of one month following publication during which the mark remains open to opposition.

Date of Issue. The date upon which registration of the mark is entered on the official register and a formal certificate of registration issued.

Priority Date. The date of filing the application in the country of origin.

Convention Date. The convention priority date for foreign applications is the date of the first filing of the application in the country of origin.

Unlike patents, application filing date and granting date have no significance in trade mark registrations and therefore do not appear in the above list of dates.

The assignment of a registered trade mark by the owner to another party must be registered and entered upon the official register. Unless this be done the assignee may find that legally he is not the owner of the mark. Application for transfer of the registration should be made within six months from the date of acquisition of the mark; if it is later than this, the transfer fees become higher.

Valuable advice on procedure is contained in the official pamphlet " Instructions to persons who wish to register trade marks," issued free on application by the Patent Office. The pamphlet includes a list of the official trade mark forms to be used for specified purposes and of the fees required.

Literature

The International Convention for the Protection of Industrial Property, 1938.

*Trade Marks Act, 1938.

*Trade Marks Rules, 1938.

*Trade Marks (Amendment) Rules, 1955 and 1956.

*Alphabetical Index to the Substituted Classification of Goods.

*List of Goods in each of the Classes of the Classification of Goods.

*The Patents Appeal Tribunal Rules.

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Trade Marks and the Law of Unfair Competition. T. A. Blanco White, 1951.

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*Obtainable from the Patent Office.

COOKER MANUFACTURERS' REPORT

FROM time to time representatives of the Electric Cooker Section of the British Electrical & Allied Manufacturers' Association meet the press to report progress. At one of these gatherings last week activities during the first half of this year were reviewed. Mr. A. S. Oldhams, chairman of the Section, who presided, said that the production of the twelve members had amounted to 251,596 units, an increase of 0·4 per cent, while dispatches had risen by 1·4 per cent to 237,342. Sales by the Electricity Boards had fallen from 71·9 of the total to 69·9 per cent, while those by wholesalers and contractors had risen from 23·3 to 26·4 per cent. The proportion exported had declined from 3·34 to 1·81 per cent.

A remarkable feature of the cooker business is the rapid change of ideas on the part of users. In June last year 53 per cent of cooker buyers wanted an all-cream finish; last June the figure was 35·2 per cent. There was a corresponding rise in the demand for all-white cookers from 44·6 to 62·2 per cent of the total. But the most drastic alteration occurred in the matter of boiling plates. In June, 1960, two-plate cookers represented 28·4 per cent of the total; by June, 1961, the proportion had fallen to 1·4 per cent. At the same time sales of cookers with four or more plates sprang from 4·03 to 43 per cent of the whole. Preference for radiant as against solid plates continued to grow. Cookers with under-hob grills represented 68·3 per cent of the June, 1960, total but only 41·85 per cent in June last. Thus cookers with raised and oven grills rose in favour from 31·7 to 58·15 per cent.

In spite of the fact that the annual production of electric cookers was virtually doubled between 1948 and 1960, and that there are now nearly four times as many in use than in 1939, fewer than a third of United Kingdom households have electric cookers. The United States, West Germany and Japan all have a greater degree of " saturation." And yet the ratio of the production of electric cookers to that of gas cookers has steadily risen from 1 to 4 in 1952 to 1 to 1·12 in January-June, 1961. Indeed, in one month last year parity was achieved and is expected to be reached again from time to time in the months ahead.

One desirable improvement emphasised at the meeting was the need for larger kitchens to accommodate the many electrical appliances, including cookers, now coming to be regarded as essential to modern living. For one thing, more space would permit the installation of " separates " (oven and grill-boiler units side by side) which many housewives would like to have. This is a matter in which housing authorities, architects and builders need " education."

VULCANISED FIBRE SHEET

THE British Standards Institution has published a revision of the 1936 edition of B.S. 216 covering two grades of vulcanised fibre sheet from $\frac{1}{16}$in to 1in thick for use in electrical equipment. The original edition covered only one grade of sheet, which was of natural colour. The new edition now includes a second grade, having slightly lower properties. Either grade can be obtained in other colours, although natural colour is assumed. The test for water absorption has been omitted but a warning is given that the fibre should be used under dry conditions. The methods of test have been revised to agree as far as possible with other insulating materials. Copies (6s each) may be obtained from the B.S.I., 2, Park Street, W.1.

Financial Section

STOCKS and SHARES

ALTHOUGH the latest overseas trade returns were regarded as satisfactory up to a point, neither they nor the other key indicators to the state of the economy seem yet to have produced anything conclusive about the effectiveness of the Government's restrictive policies as a cure for our economic troubles, or about the likely duration of their imposition. Also, without any decisive change in the dangers of the international situation, Stock Exchange markets still lack the impetus which might start the revival of interest normally expected towards the end of the holiday season.

Dull Markets

Few changes of any consequence affected industrial shares during the week, but the tendency for prices to drift downwards persisted. In the electrical lists, G.E.C. remained dull at 28s 9d despite the encouraging points in the chairman's annual review, while English Electric and A.E.I. also eased a little further. Parsons and Reyrolle lost 1s 9d each. E.M.I. fell by the same amount to 35s 3d, their lowest of the year, but British Electronic Industries at 10s 9d recovered most of the setback which had followed the previous week's publication of the annual results. Reliance-Clifton, at 18s 9d, and Plessey, at 36s 9d, were quoted "ex" scrip issues in the proportions respectively of one-for-two (in "A" non-voting shares) and one-for three.

Dimplex Results

Fine figures in the Dimplex Company's report for the year ended in June had been confidently anticipated. Even so, the extent of the further improvement shown in the preliminary announcement was described in the market as astonishingly good in circumstances which have made trading very difficult for the makers of other forms of domestic equipment. At £555,000 (before tax) profits for 1960–61 are up by as much as 79 per cent on last year's, and more than three times those of 1958–59. The dividend goes up from the equivalent of 25 to 35 per cent and would, say the directors, have been substantially higher but for the Chancellor's appeal for restraint: indeed the new rate involves the distribution of less than a quarter of the net surplus available. For full measure, shareholders are to receive a two-for-three scrip issue. After dipping momentarily to 74s 6d in advance of the statement, the price of the shares was marked up immediately afterwards to over 80s, at which level the yield works out at about 2¼ per cent.

Dubilier Condenser

As suppliers of mass produced components to the radio and television

Price Changes in

Company or Board	Nom. Value	Middle price 18th Sept.	Week's Rise or Fall	Dividend Pre-vious	Dividend Last	Yield %	1961 High-est	1961 Low-est
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	71		3	3	4 4 6	75½	70½
Brit. Elec. 1974/77	100	66		3	3	4 11 0	70½	64½
Brit. Elec. 1976/79	100	68½		3½	3½	5 2 3	73½	67
Brit. Elec. 1974/79	100	75½		4½	4½	5 12 6	82	75
Brit. Elec. 1967/69	100	87		4½	4½	5 3 6	91½	86
Overseas Electric Supply								
Calcutta Elec.	£1	21/-		7†	7½†	11 12 0	23/3	20/6
East African Power	£1	13/9		8	10	14 11 0	15/-	13/-
Nigerian Elec.	£1	16/9	−9d	8	10	11 18 9	19/9	15/6
Perak Hydro-Elec.	£1	21/3		10	10	9 8 3	23/6	17/6
Electrical Shares								
Aberdare Holdings	5/-	14/9	−3d	17½	17½	5 18 9	17/-	14/3
Aerialite	1/-	4/9		54	54	11 7 0	8/-	4/6
Allen, W. H.	£1	29/3	−9d	14	10*	6 16 9	42/6	29/3
Allied Insulators	5/-	8/-		20	10*	6 5 0	10/-	8/-
Alwyn Holdings	5/-	20/6		12½	15‡*	3 13 3	22/3	16/6
Anglo-Portuguese Tel.	£1	20/-		9	9	9 0 0	25/-	18/9
Arcolectric	1/-	4/9		15	15	3 3 3	6/-	3/9
Aron Meters	5/-	20/-		15	15	3 15 0	20/-	17/-
Assoc. Elec. Ind. Ord.	£1	37/3	−6d	15	15	8 1 0	48/6	35/-
Automatic Tel. & El.	5/-	15/9		17	17	—	20/-	12/9
Babcock & Wilcox	£1	25/9	−6d	9	9	6 19 9	36/6	25/6
Bakelite	10/-	46/3		17½	17½*	3 15 9	60/-	42/-
Baldwin, H. J.	2/-	1/3		10	Nil	—	1/9	1/3
Berry's Electric	5/-	53/6		30	33⅓*	3 2 3	53/6	37/-
Bowthorpe Holdings	2/-	7/9		18½	22	5 13 6	10/3	7/9
Brit. Elec. Resistance	2/-	7/-		17½	17½*‡	5 0 0	8/9	6/6
Brit. Elec. Traction: Def. Ord. "A"	5/-	50/3	−9d	40	50	4 19 6	57/6	41/9
British Electronic Ind.	5/-	10/9	+6d	—	15	6 19 6	15/3	8/9
B.I. Callender's	£1	59/-	−3d	13½	13½	4 11 6	62/3	49/6
B.I. Callender's 6% Pref. ...	£1	16/6		6	6	7 5 6	18/3	16/6
British Thermostat	5/-	30/-		20	27½	4 11 9	40/-	28/-
Brook Motors	10/-	52/6	−6d	25	25*	4 15 3	55/-	47/-
Bulgin, A. F.	1/-	13/-	−3d	55	40*	3 1 6	13/3	7/9
Bulpitts	5/-	17/9		15	16¼	4 11 6	27/6	16/9
Burco Dean	5/-	6/6		18	15	11 10 9	11/9	6/3
Cable & Wireless	5/-	17/3		10	10*‡	2 18 0	19/9	12/6
Cambridge Instruments ...	5/-	32/-		12½†	22	3 8 9	38/6	30/-
Chloride El. Storage "A" ...	£1	82/-	−1/-	17½	20	4 17 6	91/-	72/-
Clarke Chapman	£1	38/-		13¾	13¾	7 4 9	54/-	37/6
Clarke, T.	2/-	4/-		16	16	5 6 9*	5/3	3/6
Combined Elec. Mfrs.	4/-	7/-		—	12½	7 2 9	10/-	6/9
Contactor Switchgear	5/-	13/-	−3d	14	14	5 7 9	16/-	12/9
Cossor, A. C.	5/-	7/3		Nil	Nil	—	8/-	5/6
Crabtree	10/-	24/-		20	12½*	5 4 3	33/9	24/-
Crompton Parkinson	5/-	12/3		14	12½*	5 2 0	14/6	11/3
De La Rue	10/-	53/9		22½	22½*	4 3 9	70/-	51/-
Decca "A"	10/-	60/9	−6d	20	23⅓	3 17 0	70/-	52/3
Desoutter	5/-	55/-		30	35	3 3 9	68/9	49/-
Dewhurst	2/-	4/6		20	20	4 9 0*	6/6	3/9
Dictograph Tel.	2/-	10/3		20	20*	3 18 0	13/-	8/6
Dimplex	5/-	81/3	+2/6	30	35*	2 3 0	83/9	47/-
Dubilier Condenser	1/-	2/3		30	15*	6 13 3	3/-	2/-
Duport	5/-	11/6	+6d	17½	20	5 15 6*	17/-	11/-
E.M.I.	10/-	35/3	−1/9	20	17½*	4 19 3	51/3	35/3
Eleco	2/-	8/3		20	20*‡	4 17 0	10/6	4/3
Electrical Apparatus	5/-	18/-		14½	20	5 11 0	21/-	17/-
Electrical Components	5/-	8/6	+3d	11½	12½	7 7 0	9/9	7/9
Elec. Construction	£1	22/6		9	5	4 9 0	39/-	20/3
Elliott-Automation	5/-	34/-	−6d	9·3	13	1 18 3	37/6	25/6
Enfield Rolling Mills	£1	38/-	−1/6	15	15	7 18 0	51/6	38/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

industries, Dubilier Condenser were affected by a drastic reduction in the demand from those sources during the course of the year to last March, and although turnover was well maintained by increased sales in the electronic, industrial and export divisions, the trading profit came out some 24 per cent lower at £266,000. In reviewing prospects at the recent annual meeting, the chairman saw no evidence of improved demands from the television makers, and said that in the circumstances efforts were being concentrated upon increasing sales of products in the other categories. The 1s shares stand at about 2s 3d, offering a 6¾ per cent yield on the 15 per cent dividend.

Electrical Investments

Company or Board	Nom. Value	Middle price 18th Sept.	Week's Rise or Fall	Dividend		Yield %			1961	
				Pre-vious	Last				High-est	Low-est
Electrical Shares—continued						£	s	d		
English Electric	£1	29/3	−9d	10	10	6	16	9	40/9	29/3
English Electric 3¾% Pref.	£1	10/-		3¾	3¾	7	10	0	11/9	10/-
Ericsson	5/-	26/9	−3d	13†	13†	—			32/-	22/3
Ever Ready	5/-	38/-		20	22½	2	19	3	40/-	31/6
Falk Stadelmann	£1	22/6		10	7½	6	13	3	26/-	21/9
G.E.C.	£1	28/9	−9d	10	10	6	19	3	39/6	28/9
G.E.C. 6½% Pref.	£1	16/6		6½	6½	7	17	6	19/3	16/6
General Cables	5/-	4/9	−3d	15	Nil	—			6/3	4/9
G.H.P. Group	£1	21/-		6	7‡	6	13	3	24/6	17/-
Goblin (B.V.C.)	5/-	4/6		12½	10	11	2	0	8/6	4/3
Hackbridge Holdings	5/-	6/-		20	10*	8	6	9	6/9	5/-
Harland Engineering	5/-	13/3		16	16	6	0	9	19/-	13/3
Head Wrightson	5/-	23/6		14	16	3	8	0	30/-	22/-
Heatrae	2/-	13/9		12½	25	3	12	9	19/-	12/6
Holophane	5/-	16/-		26	30	9	7	6	20/6	16/-
Hoover	5/-	43/6	+1/-	90	45*	5	3	6	55/6	37/6
Hunt, A. H.	4/-	18/-	−9d	20	20	4	9	0	25/9	18/-
Intl. Combustion	5/-	23/9	−3d	30	30	6	6	3	33/9	23/9
Intl. Computers & T.	£1	91/6	−2/3	10	11¼	2	9	3	107/-	59/-
Johnson & Phillips	£1	21/6	+9d	Nil	5	4	13	0	24/-	17/6
Kenwood Mfg.	1/-	4/-		—	—	—			6/-	4/-
Laurence Scott	5/-	14/3		15	15	5	5	3	18/9	14/3
Lister, R. A.	£1	50/-	−1/-	14	14	5	12	0	56/9	45/6
Lucas, J.	£1	53/-	−9d	12½	13¾	5	3	9	71/6	52/6
Marryat & Scott	2/-	17/-	+3d	27½	32½	3	16	6	18/6	13/9
Mather & Platt	£1	37/6	−6d	11	11	5	17	3	51/6	37/6
Metal Industries	£1	57/-		15	15	5	5	3	66/6	50/-
Midland Elec. Mfg.	£1	57/6	−1/3	12	12	4	3	6	67/6	57/6
Murex	£1	40/-	−1/3	20	13*	6	10	0	51/6	39/3
Newman Ind.	2/-	7/-		12½	15	4	5	9	7/6	5/-
Oldham & Son	1/-	2/9		17½	17½*	6	7	3	3/-	2/3
Parsons, C. A.	£1	49/6	−1/9	9⅜	12½	5	1	0	72/6	46/9
Philips' Lamps	Fl.10	200/-		16	16*	1	12	0	£13½	£9¾
Plessey	10/-	36/9x.c.	+9d	17	15*‡	4	1	9	45/-	35/3
Pullin Group	2/-	11/6		25	25	4	7	0	15/-	11/3
Pyrotenax	5/-	55/-		40	45	4	1	9	65/-	46/6
Radiation	£1	23/9	−6d	12	10	8	8	6	37/6	23/6
Reliance-Clifton	5/-	18/9x.c.		15	20	3	11	6	22/-	14/9
Reyrolle	£1	40/-	−1/9	17½	9¾*	4	17	6	51/6	36/6
Richardsons Westgarth	10/-	4/3		8⅓	Nil	—			8/3	4/3
Sangamo Weston	10/-	21/-	+2/3	13⅓	10‡*	4	15	3	25/9	18/9
Scott, James	5/-	30/-		25	27½	4	11	9	32/-	25/6
Simon Engineering	5/-	37/6		—	27½	3	13	3	43/9	28/-
Smith (England), S.	4/-	14/6	−3d	17½	20	5	10	3	23/9	14/6
Southern Areas	£1	17/6		5	6	6	17	3	23/-	14/6
Strand Elec.	5/-	18/3	+3d	14·6	20	5	9	6	20/-	12/3
Sturtevant	5/-	10/3	−6d	15†	13†	10	6	0	18/6	10/3
Sun Elec.	5/-	15/-	−6d	15	18½	6	3	3	17/6	15/-
T.C.C.	10/-	41/3		35	22½*	5	9	0	43/9	40/-
Telephone Rentals	5/-	26/-	+1/3	15	15‡*	2	17	9	29/6	18/6
Thompson (John)	5/-	13/9		20	5	—			16/9	13/9
Thorn Elec.	5/-	54/6		25	25	2	5	9	63/-	44/6
Thornycroft	4/-	5/-	−6d	6	6	—			7/-	5/-
Tube Investments	£1	62/6		—	14	4	9	6	85/-	62/-
Ultra Electric	5/-	25/-		20	25	—			31/3	12/6
Walsall Conduits	4/-	10/9	−3d	15	15	5	11	6	15/-	10/9
Ward & Goldstone	5/-	28/9		35	17½*	3	0	9	36/6	25/6
Watford	2/-	6/9		25	20*	5	18	6	10/9	6/9
Westinghouse	£1	32/-		11	11	6	17	6	45/-	32/-
West, Allen	5/-	11/-		12½	13½	6	2	6	14/6	10/3
Wilkins & Mitchell	5/-	8/9		21	12	6	17	3	15/3	8/9
Wolf Electric	5/-	13/6		12½	13¾	5	1	9	17/6	13/6

Oldham & Son

In the year ended last March profits attributable to Oldham & Son improved to £149,000, and on ordinary capital increased to £750,000 by a one-for-two scrip issue the dividend is being maintained at 17½ per cent—the same rate as had been paid for the five previous years on smaller capital. Nearly all the companies in the group are said to have contributed to the expansion. Direct exports are absorbing about a quarter of the company's output: the chairman expects a hard fight to maintain this performance, and is generally cautious about predicting the future, but expresses "measured confidence" in the group's ability to hold its own. There is a yield of nearly 6½ per cent on the 1s shares at 2s 9d.

Pifco Dividend

Results of Pifco Holdings for the year ended in April suggest that sales of light electrical appliances of the kind marketed by this company have been affected by the credit squeeze at least to a much smaller extent than is the case with heavier domestic equipment. With profits up by about 11 per cent, the dividend is being raised by 5 per cent for the third year in succession, and the new rate of 35 per cent appears still to be covered as much as six times over by the net surplus. It has in previous years been the policy to deal very conservatively with profits while part of the cash consideration paid for the original acquisition of Pifco, Ltd., remained outstanding. This would of course account for the yield of no more than 2½ per cent on the 4s shares at a price of 55s. It is proposed to distribute a one-for-one scrip issue in the form of "A" shares with limited voting rights.

Interim Reports

Whereas in April the annual report of Sangamo Weston warned shareholders that this year's profits might well fail to equal those of 1960, the company's interim statement shows that in the six months up to last June there was an improvement of more than 20 per cent in trading profits. Since this information the 10s shares have been marked up to 21s. Telegraph Condenser's interim statement showed that profits in the first half of the year were nearly 30 per cent below those for the same period of 1960, but better than the second half figures. The 10s shares were unchanged at 41s 3d.

REPORTS and DIVIDENDS

Dimplex Raises Dividend.—Profits of Dimplex, Ltd., expanded from £310,371 to £555,135 in the year ended 30th June last, and with a final dividend of 20 per cent the total payment for the year is raised from 25 per cent to 35 per cent. A two-for-three scrip issue is also proposed to raise the capital to £750,000.

Sales of all products increased substantially over the previous year and the board state that but for the Chancellor's request for dividend restraint a substantially higher dividend would have been recommended.

Production was maintained at a very high level throughout the summer months, in order to build up stocks in preparation for an increased demand during the coming winter. In the first ten weeks of the current financial year, orders have been received at a higher level than last year, " so we are off to a good start," but it is far too early, the board state, to make an accurate forecast for the year. They are confident that they will continue to receive a substantial part of the available market in heating appliances.

After tax of £287,953 (£153,256) the net profit of £267,182 compares with £157,115, of which £64,313 (£45,937) is required for the year's dividend.

Phœnix Electrical Take-over.—Faulkner Greene & Co., Ltd., proposes to make an offer of £288,750 for the capital of the Phœnix Electrical Co. (London), Ltd., the consideration to be satisfied by the allotment of 962,500 ordinary 2s Faulkner shares. The two companies are already closely associated.

Advantages of the amalgamation are that there will be a much greater earning capacity and, since the business of Phœnix (unlike that of Faulkner) is not affected by adverse weather conditions, the group will be less liable to seasonal fluctuations.

Expansion of Phœnix, electrical engineers and contractors, has been particularly rapid during the past five years, and is now a very substantial private company in its own field, it is stated. Profit, before tax, for the year to 31st March, was £91,303, compared with £71,197 for the previous year, and the directors state that profits for 1961-62 will not be less than the average of the two previous years.

James Howden & Co., Ltd., is repeating a 25 per cent dividend with a final of 20 per cent for the year ended 30th April, 1961. Group profits contracted from £929,514 to £802,524. Tax absorbs £380,819 (£407,761), leaving a net profit of £421,705 against £521,753.

Pifco Holdings, Ltd.—The final dividend of 22½ per cent makes 35 per cent for the year ended 30th April, 1961, compared with 30 per cent in 1959-60. Group profits rose to £253,128 (£227,601).

The company has no unissued share capital and the board recommends the increase of the authorised capital to £300,000. A one-for-one scrip issue of " A " ordinary shares with restricted voting rights is proposed.

Dowty Group, Ltd.—Sir George Dowty, chairman, in his annual review, reports continued expansion and says that orders on hand are as high as they have ever been and that new products await manufacturing capacity.

Plessey Acquisition.—Plessey, Ltd., has purchased for approximately £500,000 all the capital of the S.P.E. Co., Ltd., from the Booker Group. S.P.E. is a subsidiary of the Pulsometer Engineering Co., Ltd.

Kalgoorlie Electric Power & Lighting Co., Ltd., announces a dividend of 10 per cent for the year to 31st March, 1961, against 7½ per cent for the previous 15 months' period—equal to 6 per cent per annum. Net profit of £37,140 compares with £55,637.

C. A. Parsons & Co., Ltd.—Interim dividend 10½d per share (the same).

John Thompson, Ltd.—Interim dividend 5 per cent (the same).

A. H. Hunt (Capacitors), Ltd.—Interim dividend 5 per cent (the same).

Arcolectric (Holdings), Ltd.—Interim dividend 7½ per cent (the same).

Ether Langham Thompson, Ltd.—Interim dividend 5 per cent (4·69 per cent equivalent).

Crofts Engineers (Holdings), Ltd.—Interim dividend 7 per cent (6¼ per cent).

New Companies

Norman Webster, Ltd.—Registered 31st July. Capital £2,000. Manufacturers of and dealers in radio and television sets, domestic and industrial appliances, etc. Directors: Hilda Gravenor and J. N. Webster. Secretary: Marianne Webster. Regd. office: 42, Friar Gate, Derby.

A. & W. Electrics, Ltd.—Registered 9th August. Capital £100. Directors: J. C. Arnold, Sadie C. J. Arnold (secretary), and D. Walter. Regd. office: 6, Cockfosters Parade, Cockfosters, Herts.

S.A.Y. (Electrical), Ltd.—Registered 30th August. Capital £100. Electrical contractors, etc. Directors: R. R. Scott (secretary), D. W. G. Adams, R. Adams and P. Yates. Regd. office: 5, High Street, Romford, Essex.

May's Electrical Services, Ltd.—Registered 31st August. Capital £5,000. Manufacturers of and dealers in electrical appliances, etc. Subscribers: J. H. May and Pamela A. Metcalfe (secretary), 20, Westgate Road, Leicester.

Spalding & Kidd, Ltd.—Registered 1st September. Capital £100. Electrical engineers, etc. Subscribers: Dorothy M. Graeme (secretary) and P. G. Graeme, 61, Fairview Avenue, Gillingham, Kent.

Trimbee & Barnes, Ltd.—Registered 1st September. Capital £100. Electrical engineers, etc. Secretary: J. Wolchover. Regd. office: 19-23, Ludgate Hill, E.C.4.

C. E. J. Bishop (Electrical), Ltd.—Registered 7th September. Capital £100. Manufacturers of and dealers in electrical equipment, etc. Directors: C. E. J. Bishop (secretary), D. J. Bishop and Doris E. Bishop. Regd. office: 5, Rectory Road, Hadleigh, Essex.

Winding-Up Petition

H. Morgenstern (Electrical), Ltd.—A petition has been presented in the High Court for the winding up of the company and is to be heard on 9th October. Anyone wishing to appear should notify A. Fraser, Somerset House, Strand, London, W.C.2, by 6th October.

Liquidations

Winding-up proceedings or liquidations are often undertaken for the purpose of reconstruction, the transfer of a business, or other reasons. The appearance of a company's name under this heading therefore does not necessarily indicate insolvency.

Tone Electrical & Engineering Co., Ltd., 27, Priory Bridge Road, Taunton.—Winding up voluntarily. Liquidator, Mr. L. S. Daniel, Bridgwater House, Corporation Street, Taunton, appointed by members and creditors on 5th September. Particulars of claims to the liquidator by 14th October.

Murts, Ltd., electrical contractors and retailers, 18, Killigrew Street, Falmouth.—Winding up voluntarily. Liquidator, Mr. A. J. Pope, 7, Alfred Street, Bath, Somerset, appointed by creditors on 30th August.

Bankruptcies

S. & E. Electrical, electrical dealers, lately carrying on business at 23, Greyfriars Street, Northampton.—Public examination 27th October at the County Hall, Northampton.

D. J. M. Green, 2, Nanson Road, Coldean, Brighton, electrical tester.—Last day for receiving proofs for dividend 27th September. Trustee, Mr. T. H. Parker, 8, Old Steine, Brighton, 1.

L. G. Archer and **R. N. Shaw,** lately carrying on business together in partnership under the style of Paramount Vacuums & Electrics as domestic appliance retailers at 308, High Street North, Manor Park, London, E.12, and formerly at 193, Plashet Road, Plaistow, London, E.13.—First and final dividend of $2\frac{7}{10}$d in the £ payable 27th September at Bankruptcy Buildings, Carey Street, London, W.C.2.

J. H. Pickwell, carrying on business under the style of J. H. Pickwell & Co., as a retailer of electrical goods and handicraft materials at 79, London Road, East Grinstead, Sussex, and as an electrical engineer and contractor at 108, London Road, East Grinstead.—Supplemental dividend of 3d in the £ payable at the Official Receiver's Office, 8, Old Steine, Brighton, 1.

R. Guise, formerly carrying on business at 12, Bantam Grove, Keresley, Coventry, under the style of Keresley Electrical Service as an electrical contractor.—Public examination 30th October at the County Hall, Coventry.

Can't stop!

—says Lanky Dynamo

Can't stop—I'm off to deliver a new L.D.C. motor—the "CRYPTO-D"—much more powerful—don't know how they manage it—and still B.S.2613—'course L.D.C. always have been quality—this "CRYPTO-D" 's a winner—no time for details now—must be off—drop 'em a line or get 'em on the blower—nice people—very helpful.

LDC

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0·1% Proof stress in tension, *tons per sq in*	30 – 35
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Thermal conductivity, *c.g.s. units*	0·42

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NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2

1956

30497. National Research Development Corporation.—Fuel cells. 27th September, 1957. (877410.)

32111. Hayward Tyler & Co., Ltd.—Electric motors of the submersible type. 22nd January, 1958. (877377.)

33922. Hoover, Ltd.—Washing machines. 18th October, 1957. (877429.)

34682. Associated Electrical Industries, Ltd.—Electronic equipment. 4th December, 1957. (877481.)

35730. Burke, J. D.—Final anode supply systems for cathode-ray tubes. 25th October, 1957. (877450.)

37380. Tricity Cookers, Ltd.—Domestic electric cookers. 6th December, 1957. (877431.)

1957

348. Hutcheon, I. C.—Electrical analogue computing devices. 23rd December, 1957. (877608.)

4134. Head, Wrightson & Co., Ltd.—Water-cooling towers. 6th February, 1958. (877380.)

5722. English Electric Co., Ltd.—Electric switchgear. 14th February, 1958. (877052.)

5900. English Electric Co., Ltd.—Circuit-breaker trip devices. 14th February, 1958. (877451.)

7597. Pye, Ltd.—Television cameras. 24th February, 1958. (877208.)

8548. Electric & Musical Industries, Ltd. —Electrical control mechanism for controlling the speed of a rotatable element. 3rd March, 1958. (877211.)

20503. Burndept, Ltd.—Construction of dry battery and a method of making it. 29th September, 1958. (877082.)

20784. United Kingdom Atomic Energy Authority.—Nuclear reactor fuel elements. 1st July, 1958. (877111.)

21213. Associated Electrical Industries, Ltd.—Electric lighting units. 11th June, 1958. (877341.)

23748. English Electric Co., Ltd.—Biological and thermal shields for nuclear reactors. 18th July, 1958. (877383.)

31166. Philips Electrical Industries, Ltd. —Bistable trigger circuit arrangements employing transistors. 4th October, 1957. (877412.)

32523. Hoover, Ltd.—Washing machines. 17th October, 1957. (877430.)

36635. Igranic Electric Co., Ltd.—Combined electrical indicating and switching devices. 25th November, 1957. (877053.)

40078. Permutit Co., Ltd.—Electrodialytic cells. 17th December, 1958. (877239.)

40116. Panelec (Great Britain), Ltd.—Electric heating installations. 24th December, 1957. (Addition to 788676.) (877054.)

1958

6869. Commissariat à l'Energie Atomique. —Fuel arrangements for use in nuclear reactors having vertical channels. 4th March, 1958. (877418.)

9295. Plessey Co., Ltd.—Variable resistors and potentiometers. 12th March, 1959. (877420.)

11984. Woodbury, T. J.—Production of electronic circuit elements. 14th April, 1959. (876991.)

13395. Philips Electrical Industries, Ltd. —Crystal diodes. 28th April, 1958. (877421.)

15792. Standard Telephones & Cables, Ltd.—Dry rectifier stack assemblies. 16th May, 1958. (Addition to 807637.) (877292.)

15826. Electric Transmission, Ltd.—Electric fuses. 14th August, 1959. (877169.) 16347. Electric fuses. 20th August, 1959. (877611.)

32990. J. A. Crabtree & Co., Ltd., and Millican, R. M.—Electric contactors. 6th October, 1959. (877036.)

33453. General Electric Co., Ltd.—Electric current stabilising circuits. 20th October, 1959. (877496.)

34847. Siemens & Halske A.G.—Electromagnetic interruptor devices. 30th October, 1958. (877272.)

35550. Siemens & Halske A.G.—Subscribers' relay-less circuit arrangements for use in a telecommunications installation. 5th November, 1958. (877426.)

1960

8557. Farbwerke Hoechst A.G.—Horizontal gas-tight electrolytic cell. 10th March, 1960. (877395.)

12934. Eaton Manufacturing Co.—Eddy current machines. 12th April, 1960. (877315.)

20509 Godderidge, J.—Arrangements for winding wire at high speed. 10th June, 1960. (877319.)

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 243a, Dorset House, Stamford Street, London, S.E.1, to ascertain that the proposed dates for their functions do not clash with others already arranged

MONDAY, 25th SEPTEMBER

Birmingham.—Chamber of Commerce, 75, Harborne Road, Edgbaston, 6.30 p.m. I.E.S. Birmingham Centre. Chairman's address by S. C. Dinenage, followed by informal supper.

Bournemouth.—Grand Hotel, Firvale Road, 8 p.m. A.S.E.E. Bournemouth and District Branch. "Modern Trends in Electrical Water Heating," by L. L. Hughes.

Leeds.—Houldsworth School of Applied Science, University, 7.30 p.m. Institution of Plant Engineers, West and East Yorkshire Branch. "The Construction of the Bradwell Heat Exchangers," by J. Shaw and G. Cain.

Watford.—Compass Hotel, 8.15 p.m. A.S.E.E. North West London Branch. "Electromagnetic Drives," by J. B. Bailey.

TUESDAY, 26th SEPTEMBER

Aylesbury.—Technical School, 7.30 p.m. A.S.E.E. Oxford and Districts Branch. "Fluorescent Lighting Circuits: Installation and Fault-finding."

Farnborough.—Technical College, 7 p.m. British Institution of Radio Engineers, Southern Section. "Lighting—Facts and Fancies," by W. A. Gambling.

Leicester.—Wharf Street Telephone Exchange. A.S.E.E. Leicester Branch. Visit.

Demonstration Theatre, East Midlands Electricity Board, Charles Street, 6.15 p.m. I.E.S. Leicester Centre. Chairman's address by H. R. Ruff.

London.—Manson House, 26, Portland Place, W.1, 6.30 for 7 p.m. Society of Instrument Technology. "Underground Gasification of Coal—Some Features of Instrumentation," by Dr. A. E. Balfour, and "Trends in Mining Instrumentation," by A. E. Bennett.

TUESDAY, 26th SEPTEMBER to FRIDAY, 6th OCTOBER

London.—Olympia. Heating, Ventilating and Air Conditioning Exhibition.

WEDNESDAY, 27th SEPTEMBER

Birmingham.—Blackwell Golf Club. Birmingham Electric Club. Autumn golf meeting, followed by supper at 6.45 p.m.

London.—School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, W.C.1, 6 p.m. B.I.R.E. London Branch, Television Group. "Some Recent Developments in Television Tape Recording," by P. E. Axon, K. Machein and A. Harris.

University College, 10.30 a.m. British Institution of Radio Engineers, London Branch. Symposium arranged by the Education and Training Committee on "The New Graduateship Syllabus and the Institution's Recommendations for Practical Training."

Portsmouth.—Royal Air Force Association Club, Cosham, 7.30 p.m. A.S.E.E. Portsmouth and District Branch. "The Application of Epoxide Resins in Industry," by T. S. Gray.

Sheffield.—Kenwood Hall. Society of Instrument Technology, South Yorkshire Section. One day symposium "New Techniques in Primary Measuring Methods."

Wolverhampton.—College of Technology, 7.15 p.m. British Institution of Radio Engineers, West Midlands Section. "The Single Crystal Circuit," by D. H. Roberts.

THURSDAY, 28th SEPTEMBER

Belfast.—Central Hall, Rosemary Street. A.S.E.E. Northern Ireland Centre. "Subscriber Trunk Dialling," by T. S. Wylie.

Chester.—Stanley Palace, Watergate Street, 7 p.m. Society of Instrument Technology, Chester Section. "Our Technology and our Society," by G. C. Eltenton.

Croydon.—Greyhound Hotel, 8 p.m. A.S.E.E. South London Branch. Films: "A Story of Achievement" and "Traders in Leather."

Glasgow.—Grosvenor Restaurant. Institution of Plant Engineers, Glasgow Branch. Ladies' night. Dinner followed by visit to Alhambra Theatre.

London.—Grosvenor House, Park Lane, 6.30 for 7 p.m. Electrical Engineers' Exhibition Dinner.

Connaught Rooms, W.C.2, 12.30 for 1 p.m. Batti-Wallahs' Society. Luncheon.

THURSDAY, 28th SEPTEMBER to SATURDAY, 30th SEPTEMBER

Brighton.—Purchasing Officers' Association. "Minibition."

FRIDAY, 29th SEPTEMBER

Birmingham.—Imperial Hotel, Temple Street, 7.30 p.m. Institution of Plant Engineers, Birmingham Branch. "The Planning, Application and Maintenance of Industrial Lighting," by V. Heydon.

Coventry.—Conservative Rooms, 16, Queens Road, 8 p.m. A.S.E.E. Coventry and District Branch. "Load Tanks for Testing Large Alternators," by G. Dawson.

Crewe.—Royal Hotel, 7.30 p.m. A.S.E.E. Stoke and Crewe Branch. "Static Switching Control," by B. A. W. Midgley.

Glasgow.—Grand Hotel, Charing Cross, 12.30 p.m. I.E.S. Glasgow Centre. Luncheon meeting.

Nottingham.—Trent Bridge Hotel. A.S.E.E. Nottingham Branch. Annual dinner.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Argentina.—Direccion de la Energia, Buenos Aires. 9th October. 33/13·2 kV transformer substation. (E.S.B. 29718/61.)*

Australia.—State Electricity Commission of Victoria. 9th October. Thirty-six 66 kV and thirty-six 22 kV potential transformers. (E.S.B. 29189/61.)* 11th October. Four 22/2·2 kV signal transformers. (E.S.B. 29701/61.)* 16th October. Industrial television camera and control unit monitor. (E.S.B. 29187/61.)*

N.S.W. Electricity Commission. 16th October. Four 22/2·2 kV transformers. (E.S.B. 29701/61.)*

Batley.—Street Lighting Department. 4th October. Supply of tungsten and discharge lamps. (See Classified Advertisement Section.)

Belfast.—Corporation Electricity Department. 13th October. Radio-telephone equipment. (See Classified Advertisement Section.)

Bolivia.—Development Corporation. 16th October. Four 500 kW diesel generators. (E.S.B. 29110/61.)*

Bournemouth.—Corporation. 1st November. Electric trucks and battery chargers. (See Classified Advertisement Section.)

Burma.—Union Purchase Board. 9th October. Batteries. (E.S.B. 29473/61.)*

Ceylon.—Ministry of Agriculture, Land, Irrigation and Power. 24th October. Switch-fuse units. (E.S.B. 28885/61.)*

Durham.—County Council. 27th September. Electrical installation at Brandon Modern School and Spennymoor Recreation Ground Nursery School. County architect, South Street, Durham.

Edinburgh.—Forth Road Bridge Joint Board. 16th October. Road heating installation. (See Classified Advertisement Section.)

Egypt.—U.A.R. Embassy Commercial Bureau, London. 5th October. 63 kV transmission lines. (E.S.B. 29117/61.)*

Formosa.—Central Trust of China. 4th October. Electric muffle furnace. (E.S.B. 29171/61.)*

India.—Punjab State Electricity Board. Air-break switches. (E.S.B. 29974/61.)*

India Store Department. 23rd October. Auxiliary transformers for Chandrapura power station. (See Classified Advertisement Section.)

Bombay Electric Supply and Transport Undertaking. 2nd November. Static capacitors and capacitor banks. (E.S.B. 29141-2/61.)*

Irish Republic.—Electricity Supply Board. 16th October. Extension of North Wall power station. (E.S.B. 29115/61.)* 1st November. Construction of power station buildings, Shannonbridge, Co. Offaly. (E.S.B. 29114/61.)*

Neath.—R.D.C. 2nd October. Sodium lighting at Tonna. Engineer and surveyor, 18, Orchard Street, Neath.

Nigeria.—Electricity Corporation. 30th October. 132 kV transmission line, Aba-Umuahia-Oji. (E.S.B. 29143/61.)*

Pakistan.—Stores Division (Electricity), W.A.P.D.A., Lahore. 7th October. Cables. (E.S.B. 29131/61.)* 10th-12th October. Meters. (E.S.B. 29132-6/61.)* 17th October. Fifteen 33/0·4 kV transformers. (E.S.B. 29162/61.)*

Director of Supply, Motijheel, Dacca. 4th October. Batteries. (E.S.B. 29121/61.)* 5th October. Electric lamps. (E.S.B. 29415/61.)* Refrigerators. (E.S.B. 29410/61.)* 10th October. Transformer and switchgear. (E.S.B. 29407/61.)*

South Vietnam. — Central Purchasing Authority. 6th October. 180 kVA generating set. (E.S.B. 28896/61.)*

Sunderland.—Corporation. 12th October. Electrical installation at Town End Junior and Infants' School. Borough architect, Grange House, Stockton Road.

Thailand. — Metropolitan Electricity Authority, Bangkok. 19th October. Fuse cut-outs. (E.S.B. 29424/61/D.L.F.)*

United States.—Bureau of Reclamation, Denver. 3rd October. Two 230 kV circuit-breakers. (E.S.B. 28849/61.)*

Whickham (Co. Durham).—U.D.C. 13th October. Electric street lighting, Swalwell Bank, Dunston Bank, and King George Avenue, Dunston. Council's surveyor.

Yorkshire.—North Riding County Council. 16th October. Lighting of traffic roundabout. (See Classified Advertisement Section.)

ORDERS PLACED

Durham.—County Education Committee. Electrical work in additions to Ryton Modern School (£10,452).—Devereux, Moodie & Co.

Scotland.—Scottish Region, British Railways. Electrical installation in yard and buildings at Ayr Passenger Station.—Sturrock Power Installation. Electric power distribution at Barassie.—British Insulated Callender's Cables. Signalling equipment at up yard departure sidings, Millerhill marshalling yard.—Westinghouse Brake & Signal Co. Installation of electric lighting in main office and other buildings, Sighthill freight terminal.—James Scott & Co. Six battery operated tractors, Sighthill goods terminal.—Conveyancer Fork Trucks.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Ashington.—Shopping centre to serve Green Lane estate; M. Jameson, U.D.C. surveyor, Urban Council Offices.

Ashton-in-Makerfield.—Houses (110), Low Bank estate; housing architect, Town Hall.

Barrow-on-Soar.—Additions to council offices; R.D.C. surveyor, Fowke Street, Rothley, Leicestershire.

Basildon.—Maisonnettes (56), Victoria Road, Laindon; U.D.C. surveyor, 88, Town Square.

Bath.—Factory, Brassmill Lane, for Rotork Engineering Co., Ltd., Lower Mill Lane, Twerton.

Bentley.—Bungalows (37), Pipering Lane; U.D.C. surveyor.

Birmingham.—Works and offices, Weaman Street and Steelhouse Lane; Birmingham Post & Mail, Ltd., High Street.

Bishop Auckland.—Additions to Lady Eden Hospital for Newcastle Hospital Board, Benfield Road, Newcastle-on-Tyne; P. H. Knighton, chief architect.

Blackpool.—Multi-storey car park with restaurants, etc., on ground floor, Princess Street (£500,000); borough surveyor, Municipal Offices.

Bridgend.—Department store at Brackla; J. Morgan Harries, architect, 40, Caroline Street.

Calne and Chippenham.—Houses (63), first phase redevelopment of Rudloe Camp; Edwards & Webster, architects, 10, St. Mary Street, Chippenham, Wilts.

Carlisle.—Additions to Carlisle Technical College for the City Council (£260,000); Buckland & Haywood, architects, Norwich Union Chambers, Congreve Street, Birmingham.

Cheltenham.—Flats (74), Arle estate, for T.C.; G. Wimpey & Co., Ltd., building contractors, London, W.6.

Croydon.—Dwellings (74), Stroud Green Way, Ashburton estate; borough engineer.

Darlington.—Factory additions, Aycliffe trading estate; Cordingley & McIntyre, architects, Owengate, Durham City.

Doncaster.—Stage II of development scheme for Royal Infirmary; George, Trew & Dunn, architects, 50, Eastbourne Terrace, London, W.2.

Durham.—Houses (100), for North-Eastern Housing Association; R. Turley & Associates, architects, 46, Jesmond Road, Newcastle-on-Tyne.

Proposed C. of E. schools at Eggleston, Hamsterley, Hutton Henry, and Shadforth, and junior school at Hamsterley for the C.C.; Tarren & Caller, architects, 16, Great North Road, Newcastle-on-Tyne.

Infants' school, Sunniside; K. Kennedy, architect, 1, The Drive, Gosforth, Newcastle-on-Tyne.

Falkirk.—Erection of shops, Callander Riggs (£178,000); Falkirk Development Co., Ltd., 140, West George Street, Glasgow.

Frome.—Motel, Bath Road; Watney Lyon Motels, Ltd., Mortlake Brewery, S.W.14.

Gateshead.—Bungalows (38), Sheriff Hill estate; borough engineer.

Havant.—Health clinic, ambulance station and community centre, Leigh Park; county architect, The Castle, Winchester.

Hull.—Works, Wassand Street; Charles D Pullan & Son, Ltd., 551, Hessle Road.

Jarrow.—Further dwellings in the Boldon overspill area, including 207 houses, 19 bungalows and 72 flats; H. W. T. Perkins, borough engineer.

Leominster.—Works and offices; Lambournes (Birmingham), Ltd., 170, Great Hampton Row, Birmingham.

Lichfield.—Bus station, Levetts Field, and dwellings (199), Wheel Lane estate; city engineer, Guildhall.

London.—Showrooms and offices, 133/139, Finchley Road, Hampstead; Aral Investments, Ltd., 30b, Wimpole Street, W.1.

North Riding.—New health centres at Eston (£24,750) and Huntington (£26,500); county architect, County Hall, Northallerton.

Scunthorpe.—Houses (156), flats (60) and garages (190), Westcliff estate; borough surveyor.

Stockton-on-Tees.—Nineteen flats and 38 maisonnettes in the central area; T. C. Hartley, borough architect, 28, The Square.

Sunderland.—Two youth centres (£40,000 each), and a special school; borough architect, Grange House, Stockton Road.

Wigan.—Houses and flats (43), Drummond Square; borough engineer, Library Street.

Winchester.—Four blocks of eight-storey flats, Winnall Manor estate; Wates, Ltd., 1528, London Road, S.W.16.

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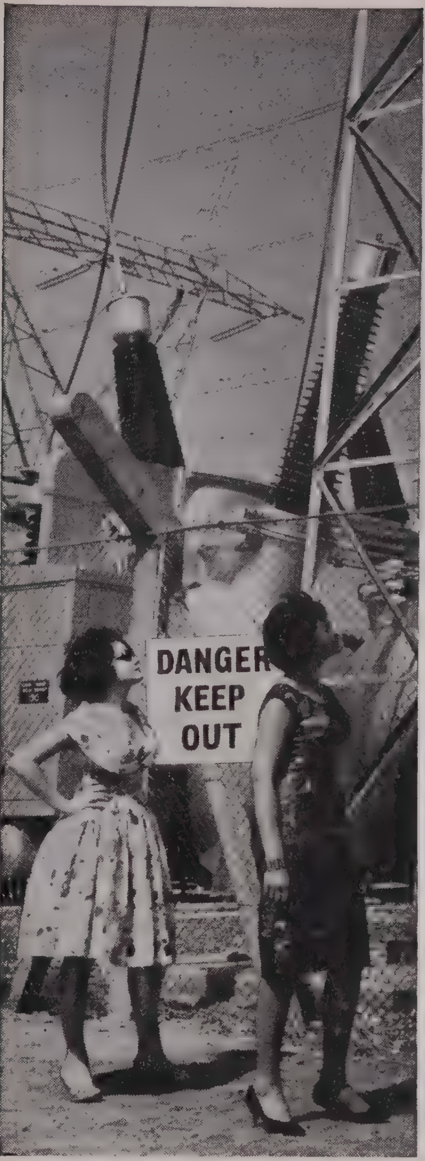
* This information is extracted from the Board of Trade *Export Service Bulletin*. Inquiries should be addressed to the Board of Trade, Export Services Branch, Lacon House, Theobald's Road, London, W.C.2 (Telephone: Chancery 4411, Ext. 738), quoting the reference given.



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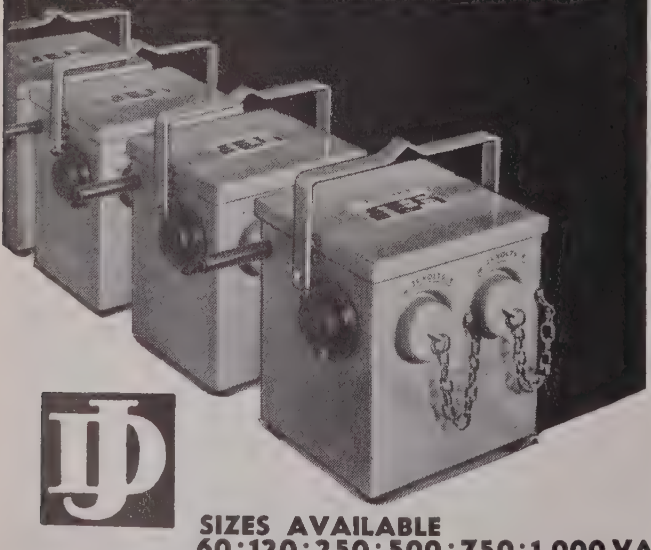

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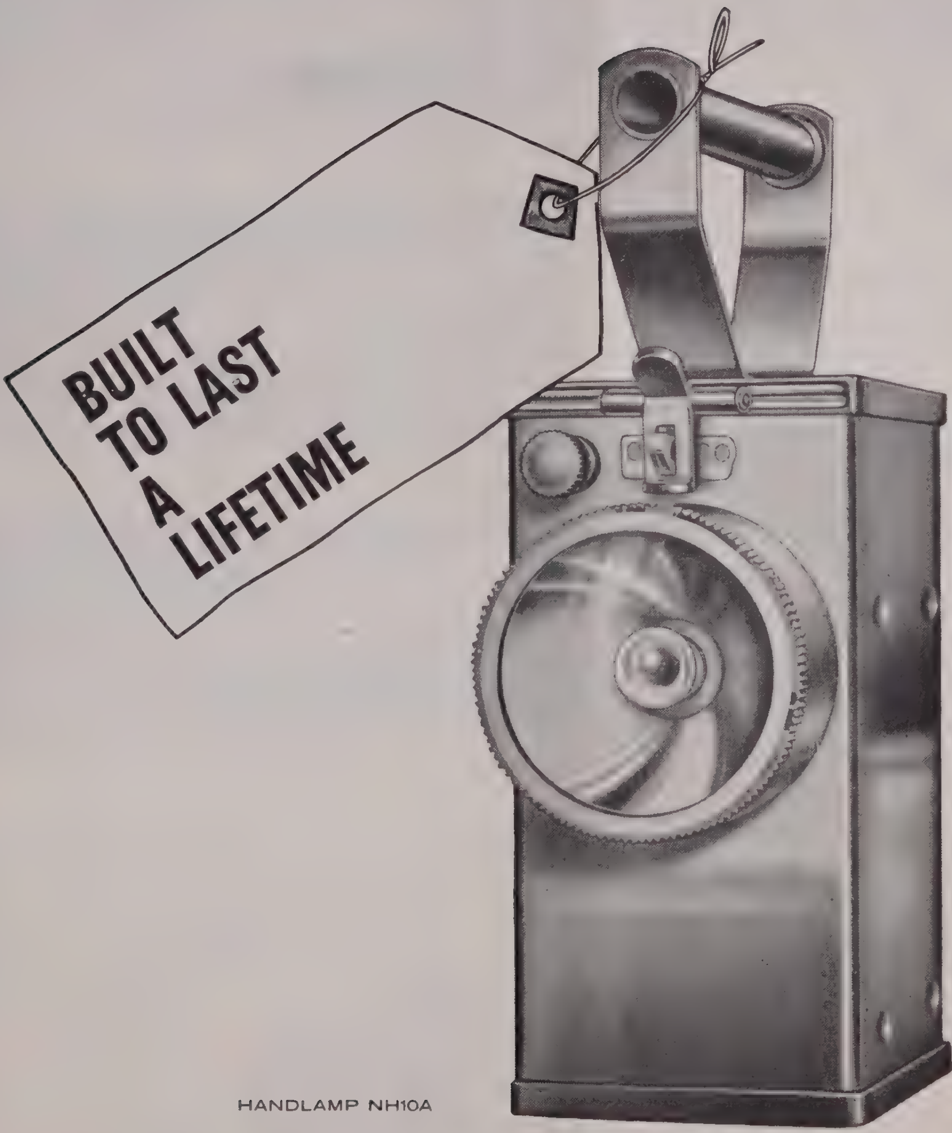

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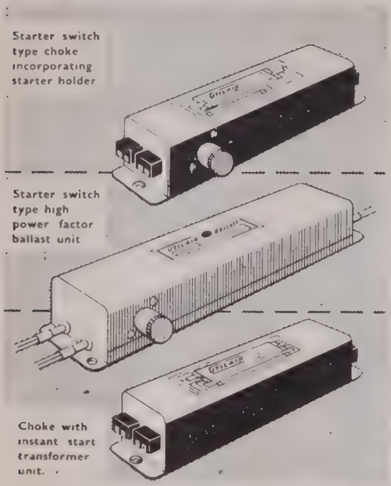
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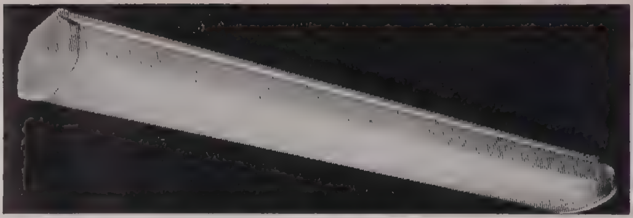

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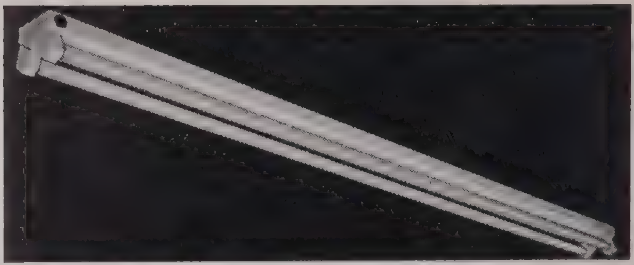

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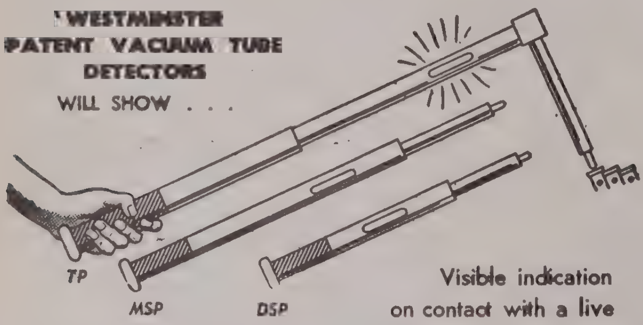

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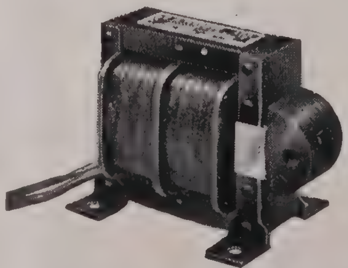

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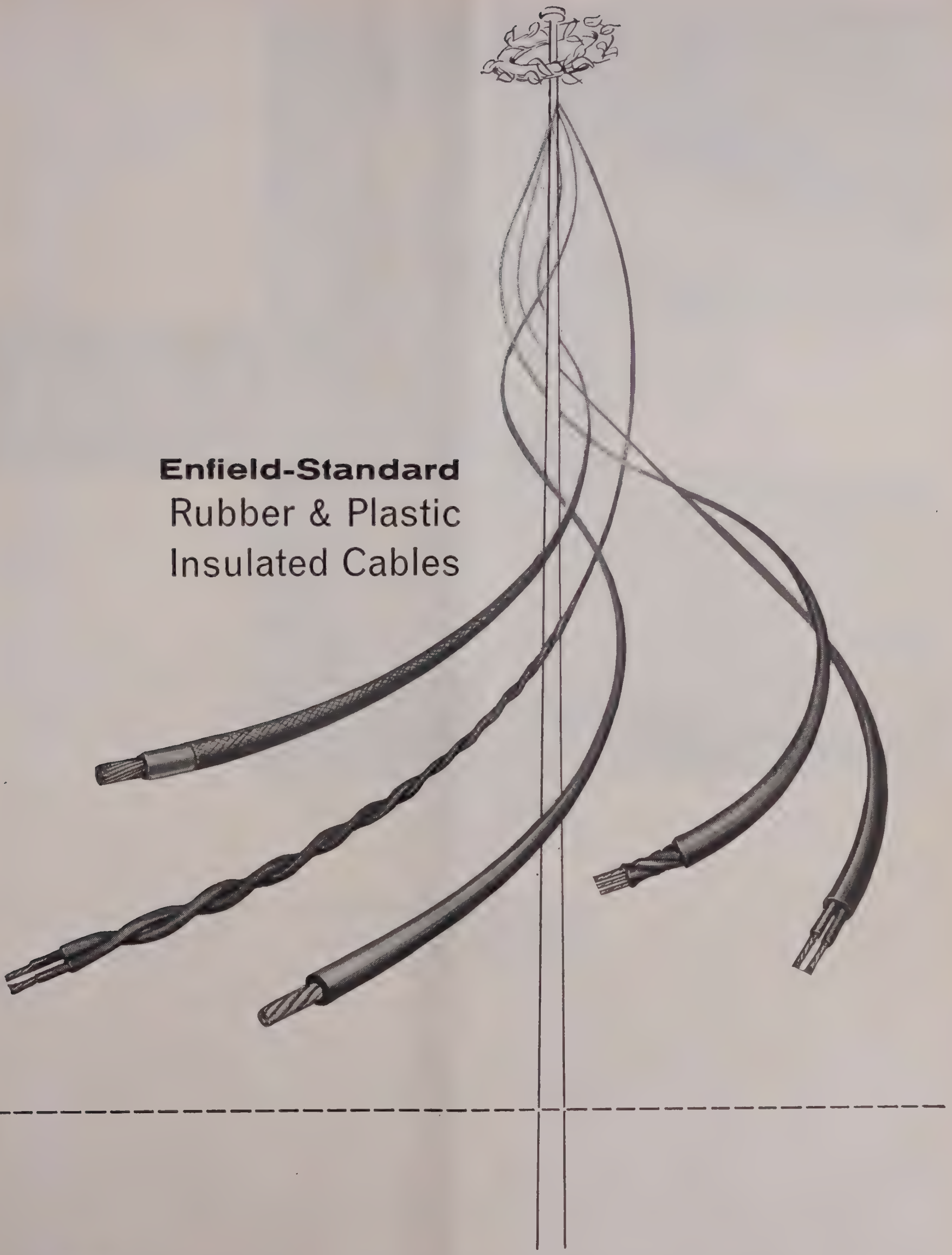

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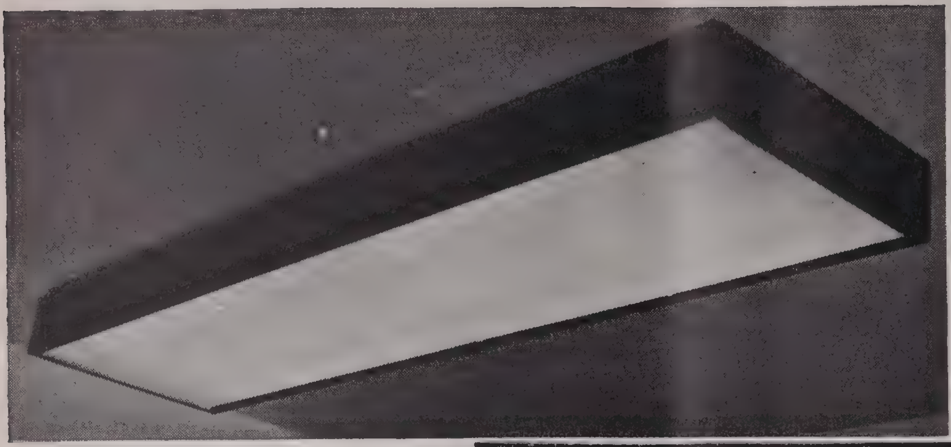

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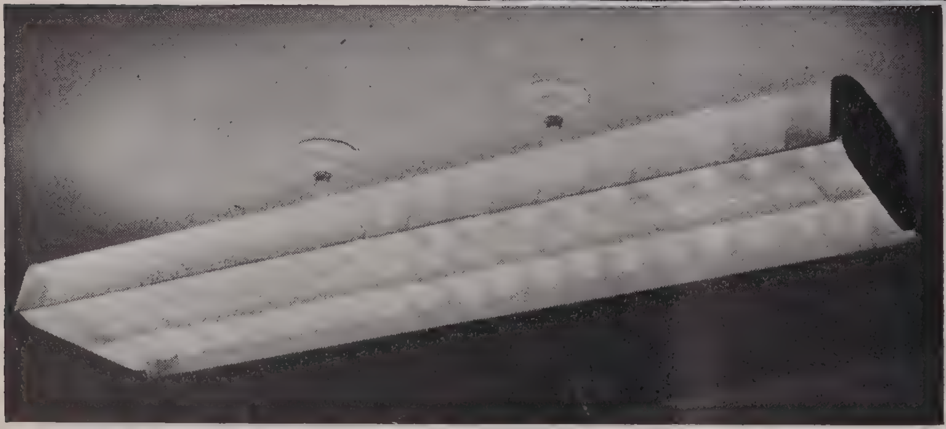

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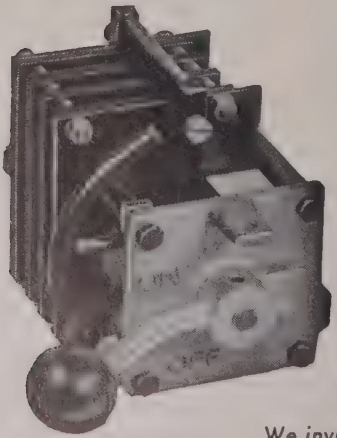

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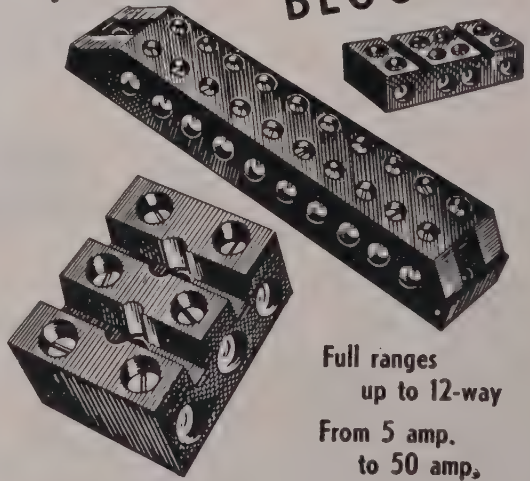

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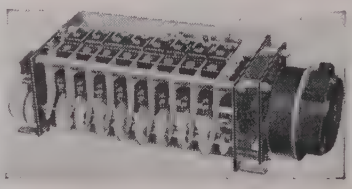

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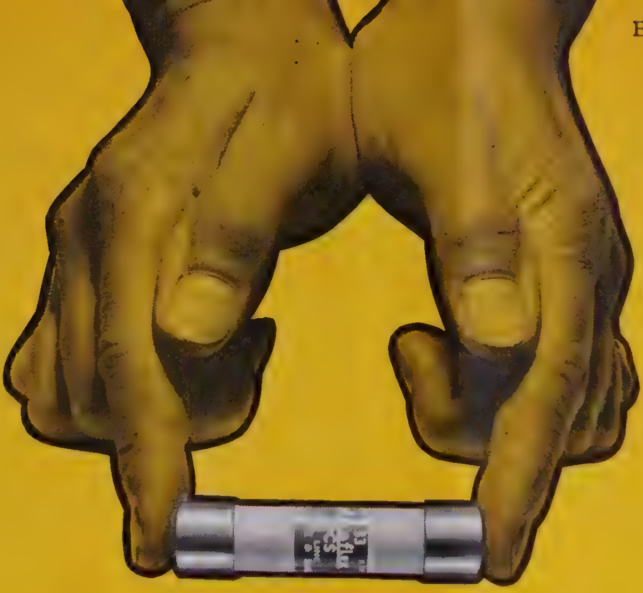

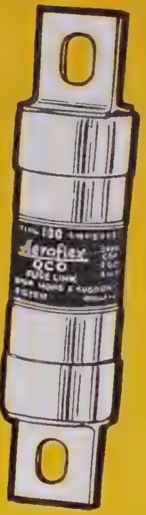

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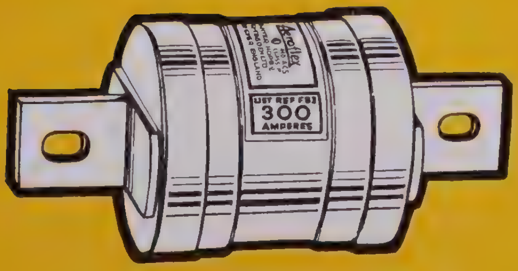

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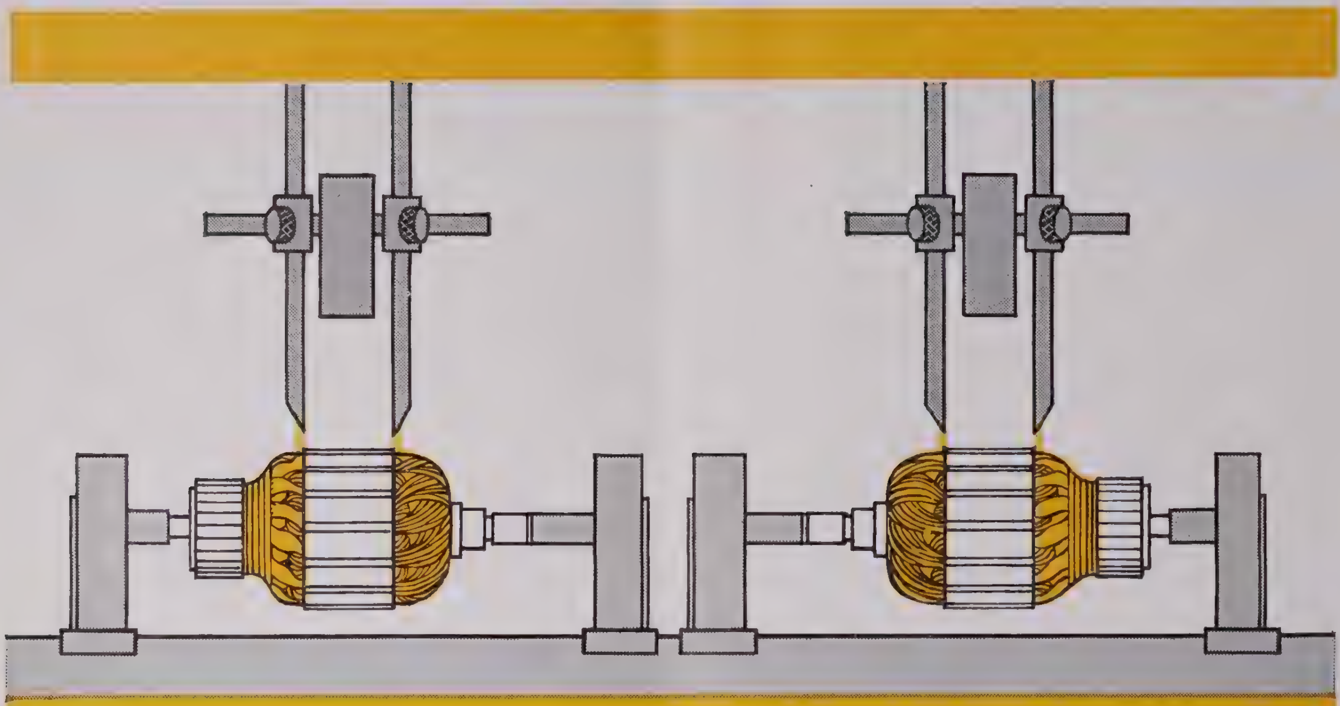

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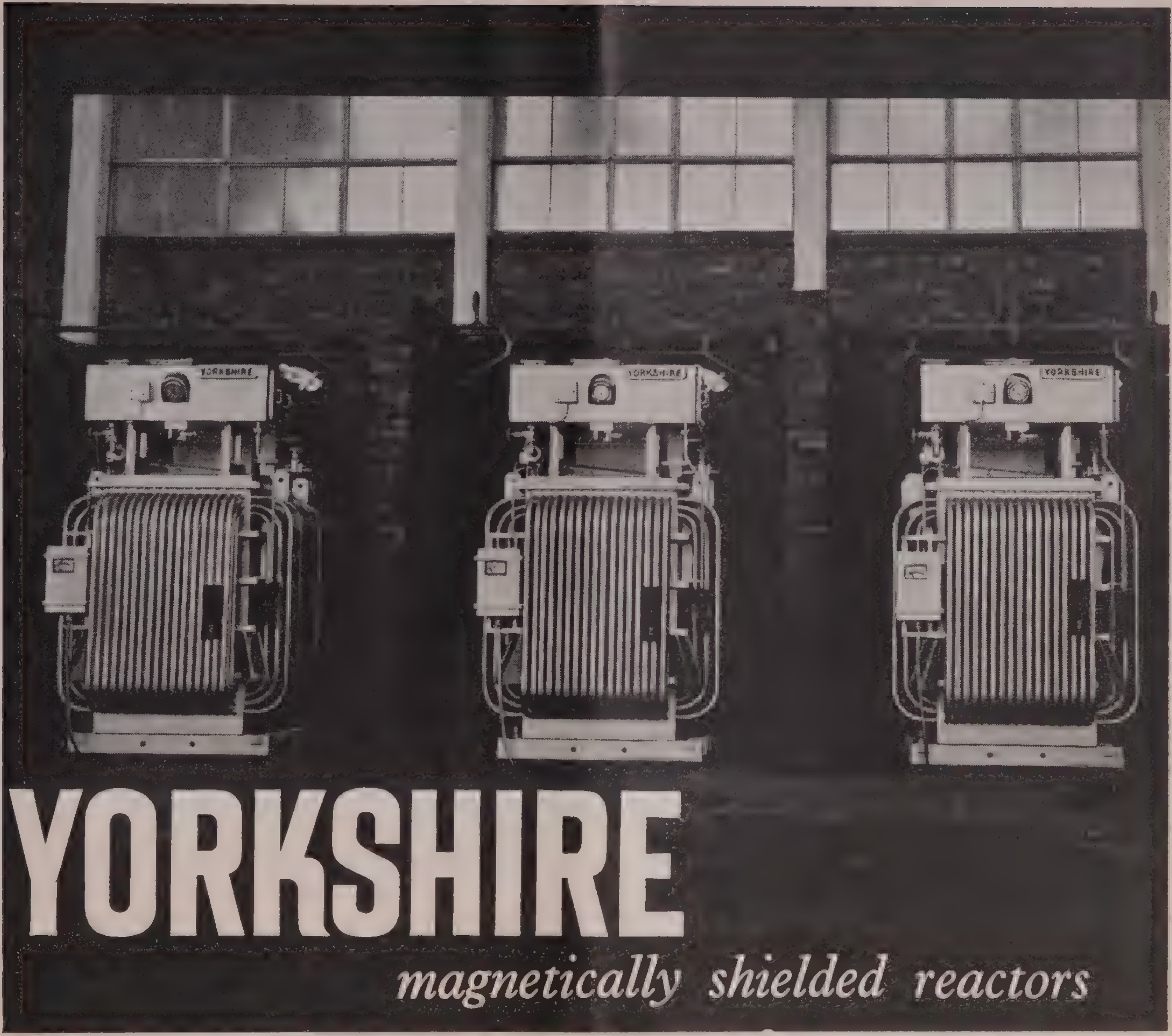

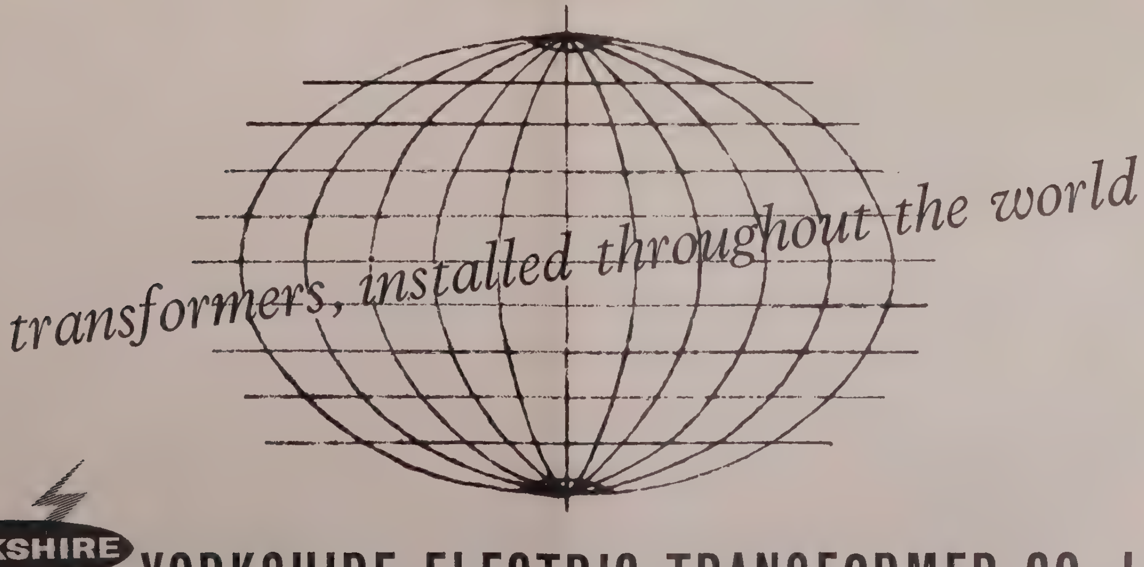
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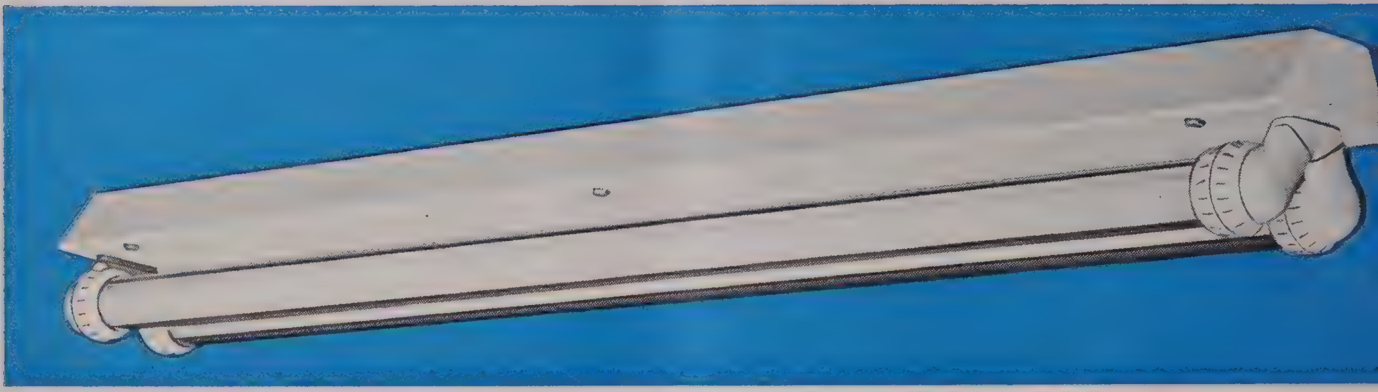

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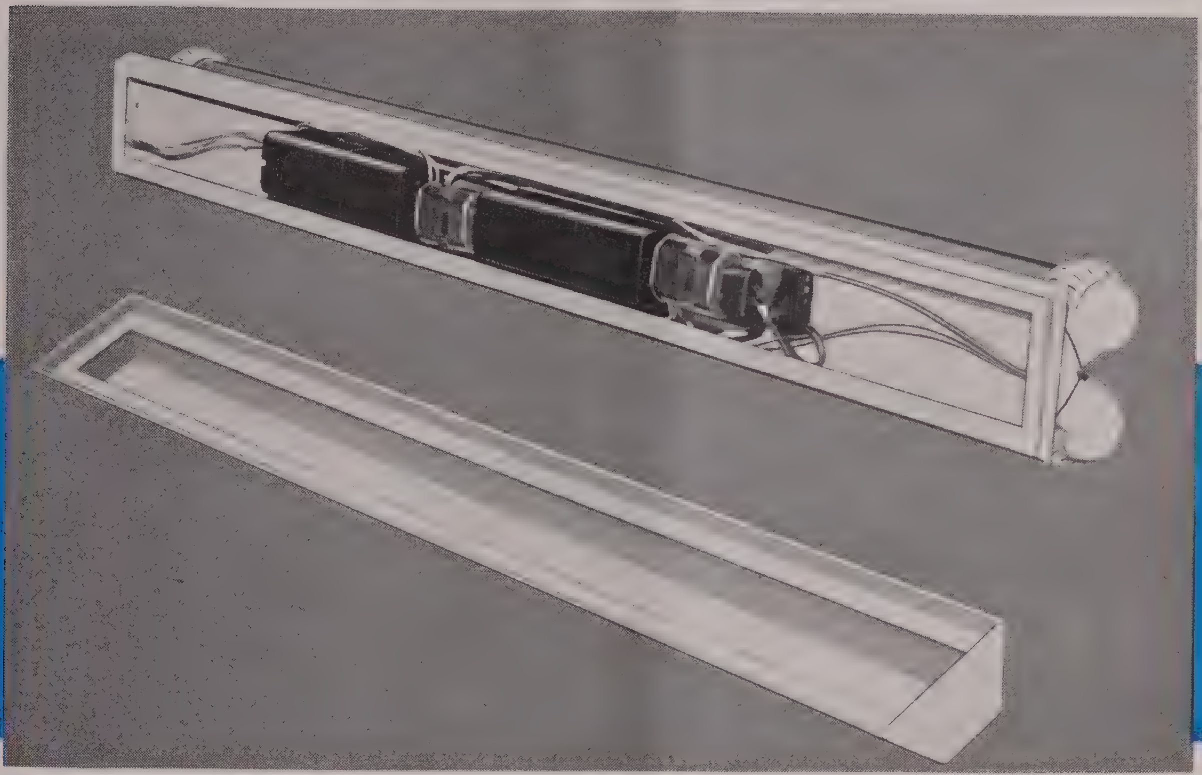

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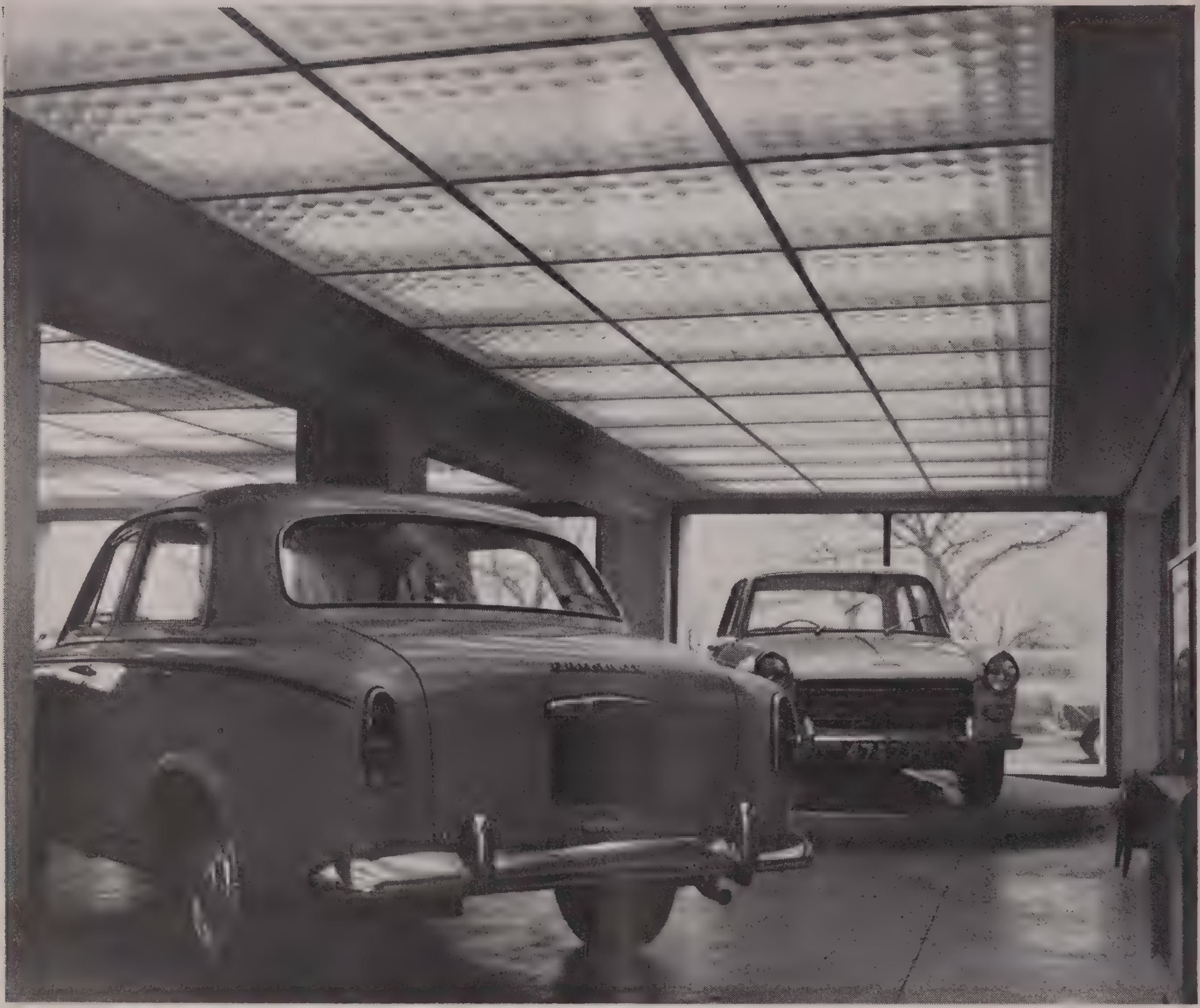

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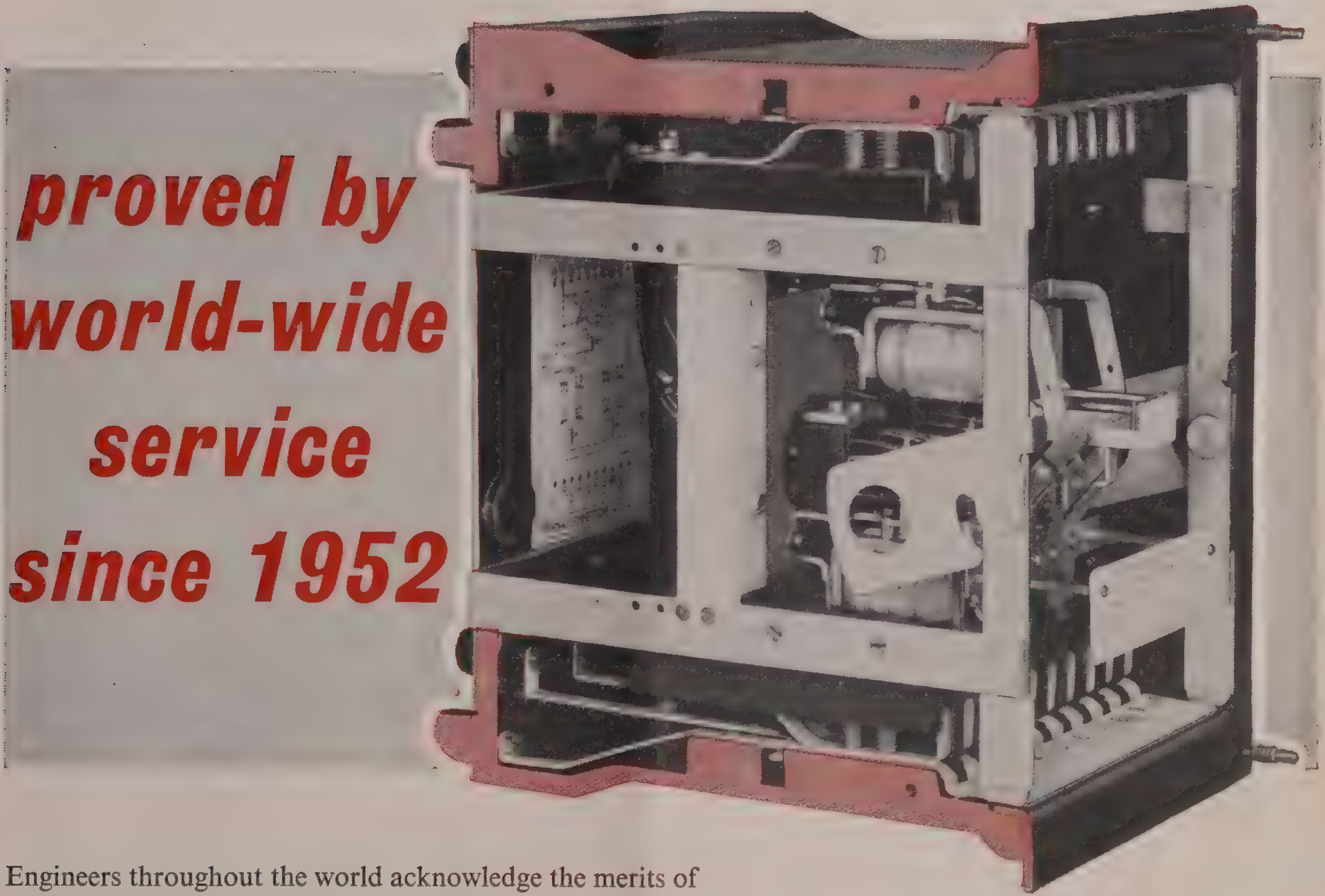

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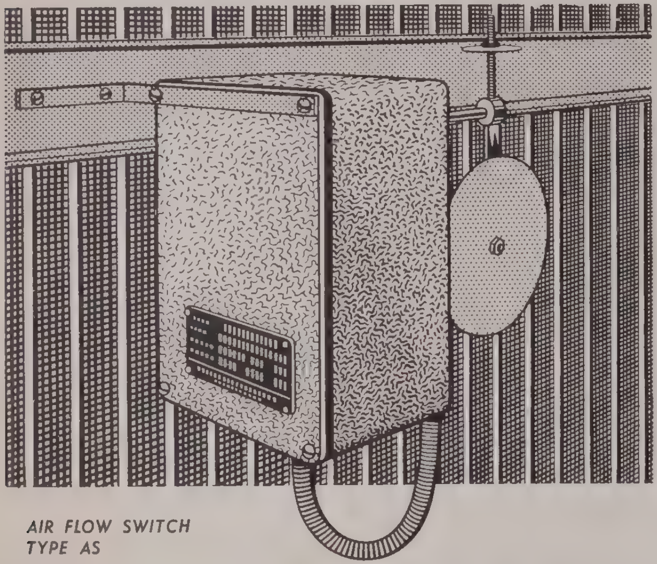
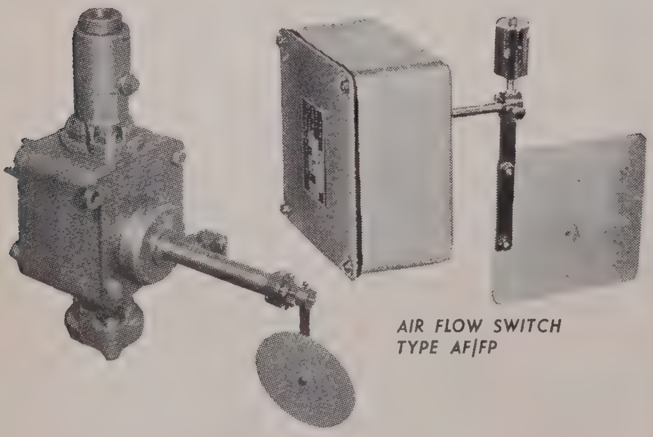


AIR FLOW SWITCH TYPE AS



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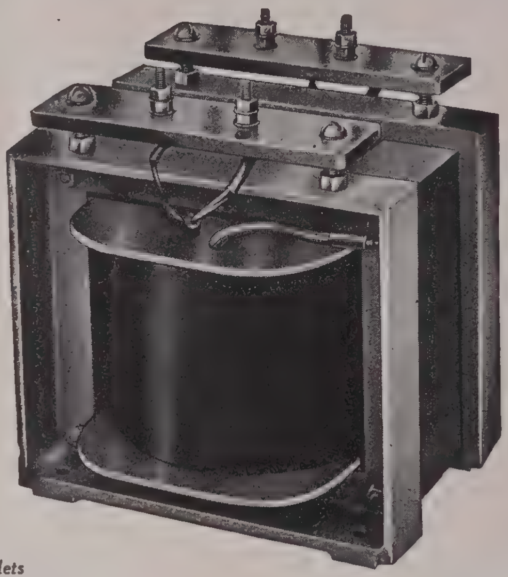

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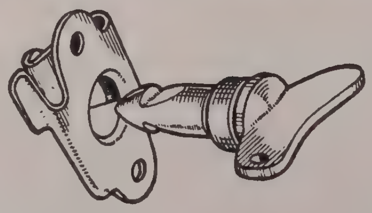

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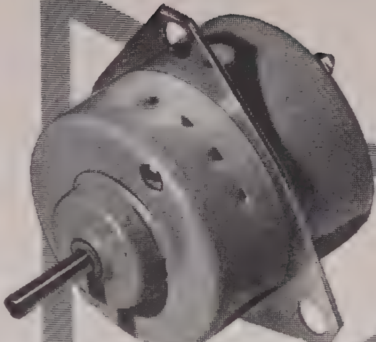

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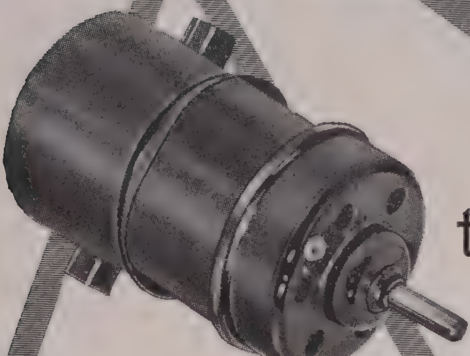

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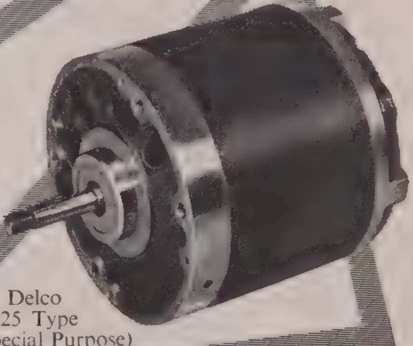

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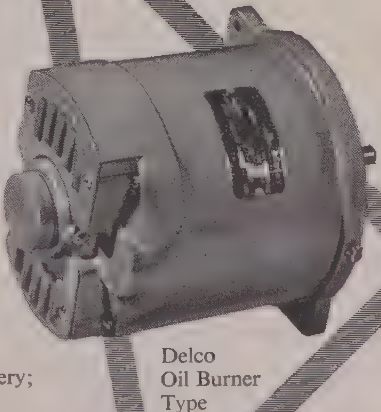

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When a self fluxing wire is required, use: Pigethane—polyurethane—to B.S.3188 range: 0.064 in. to 0.0024 in. (16 to 46 s.w.g.).
When high temperature resistance is of primary importance, use: Pigenester—polyester base—to B.S.3160 range: 0.160 in. to 0.0076 in. (8 to 36 s.w.g.).
Suitable packing is employed, ranging from small reels to bulk packs (Pigepaks).

These cables are obtainable from G.E.C. Installation Equipment Group or direct from Pirelli-General Cable Works Ltd.

PIRELLI-GENERAL

best way to buy

PIRELLI-GENERAL CABLE WORKS LTD SOUTHAMPTON & EASTLEIGH

P.6470

flawless

No, we shall not be silly and claim that our castings are as flawless as a piece of 16th century Venetian Glass. But we can go this far: we can say that just as the old master craftsmen got great satisfaction out of doing a job as well as it could possibly be done, so do we. That is why so many customers whose castings must have a fine skin which will readily anodise put their trust in Great Bridge Foundries

PRECISION CASTINGS IN ALUMINIUM, GUN METAL, GREY IRON, ETC. TO ALL SPECIFICATIONS

Phos. bronze and gun metal solid and cored sticks always in stock

THE GREAT BRIDGE
FOUNDRY CO. LTD.

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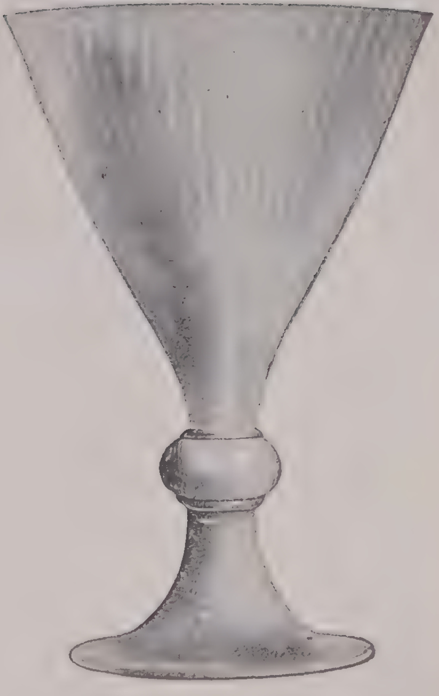
A Member of the Triplex Foundries Group

THE SIGN OF A GOOD CASTING

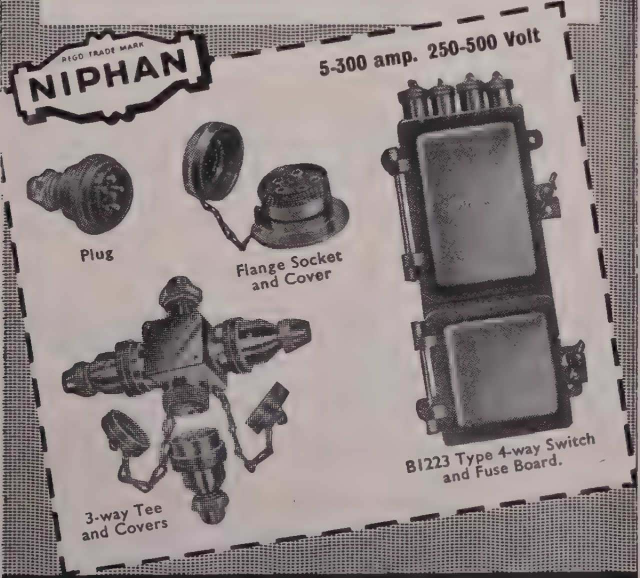


Q88

WEATHERPROOF METAL-CLAD
SOCKETS, PLUGS, SWITCH SOCKETS etc.
for all electrical purposes

REGD TRADE MARK NIPHAN

5-300 amp. 250-500 Volt



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MANUFACTURING ELECTRICAL ENGINEERS

Victoria House, Southampton Row, London, W.C.1. HOLborn 2163, 8637

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SHIMWELL, ALEXANDER & CO. LTD.

THE MARINE ELECTRICAL PEOPLE

Voigt and Haeffner Packet Switches

Original Manufacturers

10 to 600 Amps up to 600 Volts AC/DC in full range of switching sequences. All contacts silver plated. MELAMINE non-track Insulation. Also full range of Contactors, Circuit breakers, etc.

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VYBAK
ENGRAVING SHEET

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Excellent electrical properties
Choice of colour combinations
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Take advantage of the many qualities of this p.v.c. engraving sheet for easy-to-read name and instruction plates and diagrams. VYBAK engraving sheet suitable for indoor or outdoor use, is approved by Taylor, Taylor and Hobson Ltd. and Vitos Ltd.
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Bakelite Limited

12-18 GROSVENOR GARDENS, LONDON SW1. SLOane 0898

Branch Offices at: Birmingham, (Central 5011), Manchester, (Blackfriars 5174), Glasgow, (City 6825)

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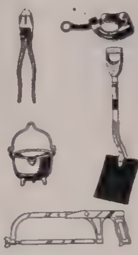

TOOLS & EQUIPMENT
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In Complete Kits or Individual Tools

Save Costs & Delay by buying direct from the Stockist Specialists

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ABBOTT, BIRKS & CO. LTD.
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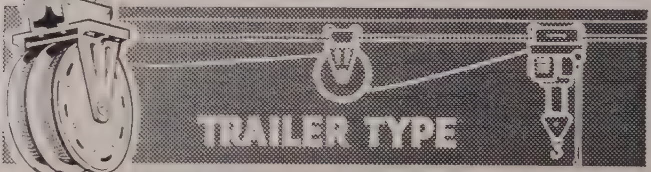
To Purchasing Officers
Please apply for our Electrical Tool Kits List

Contractors to British Government, Boards, Railways, etc.

Let METOOL Cable Collectors

NEATLY 'WIND-UP' YOUR



POWER PROBLEMS

We solve ALL problems relating to trailing cables and hose.

METROPOLITAN TOOL & PRODUCTS LTD.
21 VICTORIA STREET, NOTTINGHAM.
PHONE: 51651 GRAMS: METOOL, NOTTINGHAM

Classified Advertisements

CLASSIFIED advertisements are PREPAID at 4/- per line (approx. 6 words).

DISPLAYED CLASSIFIED:—53/- per single column inch.

Where an advertisement includes a Box Number there is an additional charge of 1/-.

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%. Remittances payable to "ELECTRICAL REVIEW."

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES TO BOX NUMBERS should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1. If an applicant for a situation appearing under a Box Number does not wish his reply to be forwarded to a particular firm or individual, instructions to this effect should be addressed to the Advertisement Supervisor, ELECTRICAL REVIEW. The name of an advertiser using a Box Number cannot be disclosed.

Advertisements are accepted up to **first post on Monday** of the week of issue

If blocks, bold type or ruled borders are required then on **Friday** prior to week of issue

All communications to be addressed to:
Classified Advertisement Department,
ELECTRICAL REVIEW
Dorset House, Stamford Street
London, S.E.1

Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

INDIA STORE DEPARTMENT

THE Office of the India Supply Mission, 2536, Massachusetts Avenue, N.W., Washington, 8, D.C., United States of America, invites tenders for the following:—

Tender Enquiry No. S/13/DLF.
For the supply of 16-MVA, 7.5-MVA and 1,000-kVA Auxiliary Transformers for Chandrapura Thermal Power Station, required by Damodar Valley Corporation.

Specification, etc., relative to the above enquiry can be obtained from the Co-ordination Branch, India Store Department, Government Building, Bromyard Avenue, Acton, London, W.3, at a cost of £1 1s. 5d. per tender. THE COST OF THE TENDER DOCUMENT IS NOT REFUNDABLE AND THE FORMS ARE NOT TRANSFERABLE. Tenders are to be returned direct to India Supply Mission, at the above address, and NOT TO THIS OFFICE, so as to reach them by 23rd October, 1961.

Specimen copy of the above enquiry can be seen at India Store Department, Engineering Branch, Bromyard Avenue, Acton, London, W.3, under the following reference number S.3335/61/NSC/ENG.2.

2385

BOROUGH OF BATLEY

Street Lighting Department

TENDERS are invited for the supply of Tungsten Lamps and Discharge Lamps.

Specification and form of tender may be obtained from the Borough Engineer, Hanover Street, Batley.

Tenders, in a plain sealed envelope (not bearing any name or mark indicating the sender), endorsed "Tender for Electric Lamps," must be delivered to the undersigned not later than Wednesday, 4th October, 1961.

The Corporation does not bind itself to accept the lowest or any tender.

L. O. BOTTOMLEY,
Town Clerk.

2355

COUNTY BOROUGH OF BOURNEMOUTH

Borough Engineer's Department

Tenders for Electric Trucks and Battery Chargers

TENDERS are invited for the supply of:—

(a) One Electric Industrial Truck and Battery Charger, and

(b) One Electric Street Cleansing Truck and Battery Charger.

Specifications and tender forms obtainable from the Borough Engineer, Town Hall, Bournemouth, returnable to me by the 1st November, 1961.

A. LINDSAY CLEGG,
Town Clerk.

2340

FORTH ROAD BRIDGE JOINT BOARD

Road Heating

TENDERS are invited for the detail design, supply, installation and putting into service of a system of heating to prevent the freezing of the road surface or snow lying thereon in the area of the toll booths on the southern approach to the Forth Road Bridge near Hopetoun Crossroads.

The area to be heated covers some 11,000 square yards and the installation must include the necessary sensing devices for automatic control, switching for hand control and heating elements working off the Electricity Board's mains at a voltage of about 240.

Contractors prepared to do the whole of the work should apply for the contract documents to the Consulting Engineers, Messrs. Mott, Hay & Anderson, 9, Iddesleigh House, Caxton Street, London, S.W.1, to whom tenders must be returned not later than 16th October, 1961.

W. BORLAND,
Clerk to the Forth Road Bridge Joint Board.

City Chambers,
Edinburgh.

2372

CITY AND COUNTY BOROUGH OF BELFAST ELECTRICITY DEPARTMENT

TENDERS are invited for the supply, delivery and erection of:—

V.H.F. Fixed and Mobile, Frequency-Modulated, 25 kc/s Channel Spacing, Radio Telephone Communication Equipments.

Form of tender and specification (No. W.199) may be obtained at the Electricity Department, East Bridge Street, Belfast, 1, on payment of a deposit of two guineas, which amount will be refunded provided a bona fide tender is lodged and not withdrawn. Extra copies may be obtained at one guinea each, which sum will not be returnable. Cheques should be made payable to the Belfast Corporation Electricity Department.

Each tender, in sealed envelope marked "Tender for Radio Telephone Communication Equipments, Electricity Committee" and endorsed with the name and address of the tenderer, must reach the undersigned not later than 4 p.m. on Friday, 13th October, 1961.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast, 1.
P.O. Box 234.

2384

CLASSIFIED ADVERTISEMENTS
ARE PREPAID

NORTH RIDING OF YORKSHIRE COUNTY COUNCIL

TENDERS invited for lighting a traffic roundabout at Ormesby, A.174.

Apply for documents to the County Surveyor, County Hall, Northallerton, Yorkshire. Tenders due 16th October, 1961.

2371

SITUATIONS VACANT

(See "Replies to Box Numbers" above)

Newcastle upon Tyne Education Committee

RUTHERFORD COLLEGE OF TECHNOLOGY

(Selected for development into a College of Advanced Technology)

DEPARTMENT OF ELECTRICAL ENGINEERING

VACANCIES exist at SENIOR LECTURER, LECTURER and ASSISTANT GRADE B level in most sections of electrical engineering. For Senior Lecturer and Lecturer posts appropriate industrial and/or teaching experience is essential and for all posts a good degree is required. Good contacts with industry are maintained and every encouragement is given for research activities and study for further degrees.

Salary in accordance with the Burnham Technical Report: Senior Lecturer £1,550 by £50 to £1,750; Lecturer £1,370 by £35 (final £40) to £1,550; Assistant Grade B £700 by £27 10s. (final £37 10s.) to £1,150, with appropriate training and graduate additions.

Further particulars and form of application (returnable within fourteen days) available from the Principal, Rutherford College of Technology, Northumberland Road, Newcastle upon Tyne, 1.

2359

ASSISTANT CONSUMERS' ENGINEER

required by ADEN GOVERNMENT ELECTRICITY DEPARTMENT on contract for one tour of 18/24 months in first instance.

Commencing salary according to age and experience in scale (including inducement allowance) rising to £1,905 a year. Gratuity at rate of 12½% of total salary drawn. Free passages. Outfit allowance £60. Children's education allowances.

Secondment from a Home Area Board may be possible in certain circumstances.

Candidates should possess H.N.C. in Electrical Engineering or equivalent, and have had technical training and experience in utilisation of electrical energy in industrial, commercial and domestic premises.

Apply to CROWN AGENTS, 4, Millbank, London, S.W.1, for application form and further particulars, stating age, name, brief details of qualifications and experience, and quoting reference M2A/51004/EF.

2344

Situations Vacant (continued)

TRINIDAD AND TOBAGO ELECTRICITY COMMISSION

WEST INDIAN Engineers who are interested in careers with the Trinidad and Tobago Electricity Commission are invited to write to the Secretary and Personnel Manager, P.O. Box 121, Port-of-Spain, Trinidad, West Indies.

There are good opportunities for young West Indian nationals with degrees in Electrical or Mechanical Engineering or who are Graduate Members of the Institution of Electrical Engineers.

Commencing salary £1,050 per annum.

Experience not necessary, but candidates MUST be qualified.

2345

YORKSHIRE ELECTRICITY BOARD

No. 2 (Huddersfield) Sub-Area

SENIOR ASSISTANT ENGINEER
(Distribution Design)

Applicants must have had considerable experience in the design of extensive underground and overhead distribution systems operating at high and medium voltage. They must be capable of taking administrative control of the Sub-Area distribution design section.

Salary N.J.B. Class L, Grade 4 (Scale 16), £1,795/£1,950 per annum.

FOURTH ASSISTANT ENGINEER
(Draughtsman).

Applicants should have had experience in cartographical and mains record work. Knowledge of surveying, subsequent plan preparation, together with some experience in the preparation of schematic and other electrical diagrams, will be an advantage.

Salary N.J.B. Class L, Grade 12 (Scale 8), £1,040/£1,165 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 2 (Huddersfield) Sub-Area, Yorkshire Electricity Board, Market Street, Huddersfield, not later than 6th October, 1961.

Head Office

SECOND ASSISTANT ENGINEER,
Distribution Design (Mains).

Applications are invited for the above position in the Chief Engineer's Department at the Board's Head Office.

Applicants must have had extensive experience in the design and construction of overhead lines for voltages up to and including 66 kV and be fully conversant with the relevant regulations and standards.

Salary N.J.B. Class K, Grade 5 (Scale 14) within the range £1,415/£1,720 per annum. The commencing salary will be dependent upon qualifications and experience.

Applications, together with the names of two referees, should be sent to the Secretary, Yorkshire Electricity Board, Scarcroft, Leeds, not later than 6th October, 1961.

No. 6 (Hull) Sub-Area

THIRD ASSISTANT ENGINEER
(Meters, Testing and Protection).

Applicants should have good general and technical education with subsequent experience in the testing and maintenance of protective gear.

The duties will include commissioning, testing and maintenance of protective gear, the testing of electrical plant and equipment, cable fault location and general electrical testing throughout the Sub-Area.

Salary N.J.B. Class L, Grade 10 (Scale 10), £1,190/£1,325 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Hull, not later than 6th October, 1961.

No. 3 (Sheffield) Sub-Area
SHEFFIELD DISTRICT

ASSISTANT ENGINEER
(Contracting).

Applicants should have had experience in estimating, tendering for and supervising electrical installation work, and in preparing specifications either with a supply authority or a firm of electrical contractors.

Salary N.J.B. Class L, Grade 11 (Scale 9), £1,115/£1,245 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Change Alley, Sheffield, not later than 6th October, 1961.

No. 7 (Grimsby) Sub-Area
SCUNTHORPE DISTRICT

CONSUMERS' ENGINEER
(General Development).

Applicants should have extensive experience of the general development of electricity supplies, including responsibility for service centres and sales staff.

Salary N.J.B. Class G, Grade 8 (Scale 8), £1,040/£1,165 per annum.

GENERAL ASSISTANT ENGINEER
(Draughtsman).

Applications are invited for the post of Draughtsman (either Electrical or Building and Civil Engineering) in the Sub-Area Drawing Office. The successful applicant will be required to assist in the drawing office on work which includes building drawings, electrical diagrams and records.

Salary N.J.B., either Class K, Grade 16 (Scale 3), £715/£805, or Class K, Grade 15 (Scale 4), £765/£870 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Road, Grimsby, not later than 6th October, 1961.

2388

MIDDLESEX COUNTY COUNCIL EDUCATION COMMITTEE

**Southall Technical College,
Beaconsfield Road, Southall, Middlesex**
Principal: J. V. Tee, Wh.Sch., B.Sc.(Eng.), A.C.G.I., D.I.C., M.I.E.E., A.M.I.Mech.E.

APPLICATIONS are invited for the following post, duties to commence on 1st January, 1962, or earlier if possible.

An ASSISTANT GRADE B LECTURER to teach Electrical Engineering and allied subjects in Ordinary National Certificate courses. Industrial experience and/or teaching experience desirable and an interest in Electrical Installation work would be an additional advantage.

Salary £738 to £1,201 per annum. Additions may be given for industrial experience (up to £330 above the minimum), training and study (up to £120 above the maximum), qualifications (£165 above the maximum).

Application forms may be obtained from the Principal and on completion should be returned by two weeks from the date of this advertisement.

C. E. GURR, M.Sc., Ph.D.,
Chief Education Officer.

2386

NORTH WESTERN ELECTRICITY BOARD

Senior Assistant Engineer (Industrial Development), Commercial Department, Area Board Headquarters

Applicants should be well experienced in the applications of electricity to a wide range of industrial processes. Duties include developing new uses for electric power; preparation of technical information sheets; organising demonstrations of industrial equipment; lectures to audiences of engineers, and co-operation with Sub-Area and District personnel engaged on technical sales.

The possession of appropriate technical or professional qualifications will be an advantage.

Salary scale £1,750/£2,085 p.a., Grade K.2. N.J.B. conditions.

Applications on forms to be obtained from the Secretary, North Western Electricity Board, Cheetwood Road, Manchester, 8, and returned to him by 9th October, 1961.

Demonstrator, Leigh District

Applicants should be qualified to lecture and advise on the utilisation of electric cookers, washing machines, refrigerators and other domestic appliances, and to give public demonstrations in service centres and at exhibitions. Applicants should possess the E.A.W. Certificate.

Salary scale £600 × £25 to £700 p.a., Grade 1. N.J.C. conditions.

Applications on forms to be obtained from the Manager, No. 2 Sub-Area, North Western Electricity Board, 2, St. George's Road, Bolton, and returned to him by 2nd October, 1961.

Sub-Area Senior Demonstrator, Sub-Area Commercial Department, Blackburn

Applicants should possess a recognised qualification in electrical housecraft and have had several years' experience in sales and demonstration work.

Duties will include contacting education authorities, women's organisations, etc.

The successful applicant will be expected to conform to the hours of duty applicable to sales staff.

Salary scale £780 × £25 to £880 p.a., Grade 3. N.J.C. conditions.

Senior Demonstrators Burnley and Rochdale Districts

Applicants must have a good knowledge of electrical appliances and be competent to give demonstrations and lectures in public halls, service centres and on consumers' premises.

The successful applicant will be required to assist in general service centre duties during normal hours of business.

Salary scale £700 × £25 to £775 p.a., Grade 2. N.J.C. conditions.

Applications on forms to be obtained from the Manager, No. 5 Sub-Area, North Western Electricity Board, Jubilee Street, Blackburn, and returned to him by 2nd October, 1961.

2377

ELECTRICAL DESIGN ENGINEER

THE HARLAND ENGINEERING Co. Ltd., ALLOA, has a vacancy for an ELECTRICAL DESIGN ENGINEER with 3 to 4 years' experience in the design of A.C. or D.C. machines. The work is varied and interesting.

Applicants should have a good H.N.C. or Degree in Electrical Engineering.

Full details of experience and technical qualifications to Personnel Manager.

2361

DUE TO RAPID EXPANSION

BRITISH CENTRAL ELECTRICAL CO. LTD.

ONE OF THE LARGEST AND OLDEST-ESTABLISHED ELECTRICAL WHOLESALERS

URGENTLY REQUIRES

1. ASSISTANT BUYERS

With wide experience of ALL types of electrical—industrial and installation—equipment, and where to buy it.

Excellent salary, superannuation, five-day week. Happy atmosphere, good prospects.

Must be willing to accept considerable responsibility and use own initiative.

2. EXPERIENCED ELECTRICAL STOREKEEPERS

Used to handling wide range of electrical — industrial and installation — equipment. Qualifications required: conscientiousness, method, neatness, and ability to maintain accurate records.

Excellent salary, superannuation, happy atmosphere and good prospects.

Apply in writing to:

Managing Director
BRITISH CENTRAL ELECTRICAL CO. LTD.
Briticent House, 6 & 8 Rosebery Avenue
LONDON, E.C.1
Telephone: TERminus 3666 (20 lines)

2341

CENTRAL ELECTRICITY GENERATING BOARD

South Thames Division

Instrument Engineer, Dungeness Nuclear Power Station
(Staff Vacancy No. 240/61)

APPLICATIONS are invited for the appointment of INSTRUMENT ENGINEER at Dungeness Nuclear Power Station.

The successful candidate will be responsible to the Maintenance Superintendent for the routine maintenance and testing of all the instrumentation associated with the power station. Initially, he will be required to organise the work of his section and prepare planned maintenance programmes for a wide variety of physical and electronic instruments. He should be capable of critically assessing the performance of the instrumentation and associated control systems and of advising on the effectiveness of this performance in relation to the operation of the station.

Applicants should possess qualifications of degree standard or its equivalent, should have had experience of the control of labour and of the administrative direction of a technical section.

The salary for this appointment will be in accordance with the National Joint Board Agreement, Schedule A, Class N, Grade 6, £1,795 to £1,950.

Applications giving age, qualifications, experience, etc., should be addressed to :—

The Personnel Officer,
Central Electricity Generating Board,
South Thames Division,
Lower Ham Road,
Kingston-upon-Thames,
Surrey,

to arrive by 11th October, 1961.

2365

RESIDENT ELECTRICAL ENGINEER

for a half-million pound electrical installation in a new commercial building in Kensington, London, area.

Applicants must have experience of electrical contracting industry on projects of a similar size and nature, and should be not less than 35 years of age.

Term of contract approximately 2 years. Applicants must give details of training, experience and position with present employer. Please state salary required.—G. H. BUCKLE & PARTNERS, 2, Harrington Gardens, London, S.W.7.

2347

ELECTRICAL ENGINEER

THE CABLE MAKERS ASSOCIATION invite applications from electrical engineers for a vacancy in their Technical Department. Knowledge of rubber and plastic wiring system cables and/or mains cables essential. Experience in cable testing, calculation of current ratings and cable dimensions desirable. Ability to write concise minutes and reports and to draft specifications will be required.

Applications, which will be treated in confidence, giving full details of age, qualifications, experience and salary required, should be addressed to the Director, Cable Makers Association, High Holborn House, 52/54, High Holborn, London, W.C.1.

2357

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

APPLICATIONS are invited for the following superannuable N.J.B. Schedule A appointments :—

ASSISTANT MAINTENANCE ENGINEER (Electrical),
CARMARTHEN BAY POWER STATION, BURRY PORT, CARMS.
(Vacancy No. 265/ER/61).

Salary Class K, Grade 8, Scale 11, £1,275-£1,410 per annum.

Applicants should possess H.N.C. or equivalent qualifications and should have had wide experience in power station electrical maintenance.

The successful candidate will be required to assist the Electrical Maintenance Engineer and the Planning Engineer.

PLANT CONTROL ENGINEER,
USKMOUTH "B" POWER STATION, WEST NASH, Nr. NEWPORT, MON.
(Vacancy No. 266/ER/61).

Salary Class K, Grade 10, Scale 9, £1,115-£1,245 per annum, plus 10% shift enhancement.

Experience of operation of modern high-pressure and temperature reheat unit plant desirable.

The successful candidate will be required to supervise the operation of units to achieve maximum thermal efficiency and safe operation. H.N.C. or equivalent qualifications are essential.

Special application forms are obtainable from Divisional Secretary, Central Electricity Generating Board, South Wales Division, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 7th October, 1961.

2402

***Situations Vacant** (continued)*

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Region

East Midlands Division

ASSISTANT PLANNING ENGINEER
STAYTHORPE A and B
POWER STATIONS
(Vacancy No. 210/61).

Applications are invited for the position of Assistant Planning Engineer at Staythorpe A and B power stations, near Newark, Notts.

Applicants should have held a position of responsibility in a modern power station and should have received a thorough practical and theoretical training. Preference will be given to candidates who are Corporate Members of a recognised professional institution or who hold qualifications leading to such membership.

Salary will be in accordance with Class M, Grade 8 (£1,440-£1,610 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 29th September, 1961.

ASSISTANT INSTRUMENT ENGINEER
STAYTHORPE A and B
POWER STATIONS
(Vacancy No. 211/61).

Applications are invited for the position of Assistant Instrument Engineer at Staythorpe A and B power stations, near Newark, Notts.

Applicants should have had sound training and wide experience in instrument making and/or repair. Preference will be given to candidates with knowledge of electronic and other modern forms of instrumentation and complex control systems as encountered in modern power stations or other large industrial organisations.

Salary will be in accordance with Class M, Grade 9 (£1,350-£1,500 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 29th September, 1961.

These appointments are pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Station Superintendent and should be returned to him by the date stated.

O. S. WOODS,
Assistant Regional Director.
8th September, 1961.

2390

AREA REPRESENTATIVES

not afraid of some blood, sweat and tears, required for the following areas: Greater London including Essex, Midlands including Home Counties, South of England including Wales.

The company is well known to the Electricity Area Boards and Electrical Contractors and are about to introduce new products.

Applicants must be between 24 and 30, well educated, and preferably with electrical sales experience.

Car provided, generous salary and commission. Interviews held in London, Birmingham and Bristol.

Apply in writing to Sales Director, Cable Covers Ltd., Power Engineer's Equipment Division, St. Stephen's House, Westminster, London, S.W.1.

2375

OVERSEAS

AIR MINISTRY WORKS DEPARTMENT

requires

ASSISTANT MECHANICAL AND ELECTRICAL ENGINEERS

under 35 years of age to fill posts in

GERMANY MALTA CYPRUS ADEN SINGAPORE

on tours of 2 or 3 years' duration with continuing employment on return to the United Kingdom.

SALARY £991 (age 25) to £1,490 (maximum) per annum

plus

FOREIGN SERVICE ALLOWANCE varying, at present, up to £1,310 p.a. according to location.

QUALIFICATIONS

At least the qualifying examination for corporate membership (or exemption) of the Institution of Electrical Engineers or the Institution of Mechanical Engineers (with appreciable electrical engineering experience) and not less than 2 years' professional experience.

PROSPECTS

Excellent opportunities of obtaining permanent pensionable posts and of promotion to higher grades with salaries up to £3,715 p.a.

Write for details to AIR MINISTRY WORKS DEPARTMENT, (W.G.d.BH),
Lacon House, Theobalds Road, LONDON, W.C.1

2342

MIDLANDS ELECTRICITY BOARD

THIRD ASSISTANT DISTRICT ENGINEER required in the Wellington District of the Shropshire and Herefordshire Area.

Applicants should have had a sound technical training and experience in construction, operation and maintenance of overhead and underground distribution systems. Technical qualifications desirable.

Salary £890/£1,015 per annum (N.J.B. Grade F.9). Superannuable.

Apply by letter within 14 days, stating age, experience, present position and salary, to Mr. W. Winwood, Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury.

F. W. CATER,
Secretary.

2376

WATFORD TECHNICAL COLLEGE

Hempstead Road, Watford, Herts

APPLICATIONS are invited for the post of HEAD OF THE DEPARTMENT OF ENGINEERING which will become vacant on 1st January, 1962.

The Department provides H.N.D. (Sandwich) and National Certificate courses in Mechanical and Electrical Engineering, a course of Part III of the I.E.E. examination, and has a well-developed section for Production Engineering.

Candidates should have high academic qualifications with good industrial and teaching experience. Research experience would be an added advantage.

Salary scale (Head of Department Grade IV), £1,950 × £50 to £2,100.

Application forms (returnable by 6th October) and further details available from the Principal.

2358

SOUTHERN ELECTRICITY BOARD

Assistant Engineer (Planning)

Yeovil District of No. 4 (Bournemouth) Sub-Area. Salary N.J.B. Class G, Grade 9 (£965-£1,090 per annum). N.J.B. conditions of service.

The successful candidate will be required to assist in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground H.V. and L.V. networks. Applicants should have had sound experience in electricity supply distribution, and the possession of suitable technical qualifications would be an advantage. The successful candidate will be required to carry out standby duties if and when called upon to do so.

The successful candidate will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, 1, Priory Road, Bournemouth, Hants, and returned to him, quoting Z.1392, not later than 2nd October, 1961.

2387

ELECTRICAL ENGINEER

Rotating Machine Control Development

A YOUNG qualified Electrical Engineer (Degree/H.N.C.) is required to work in the development department of a company manufacturing special-purpose rotating electrical machines and with a newly formed electronics division. He should be experienced in experimental work on electrical machines and in electronics, servo-mechanisms or light current engineering, or control schemes generally.

An adequate salary will be paid to the right man; the company has a good pension and life assurance scheme.

Applications giving full details of education, training and experience, which will be treated in STRICTEST CONFIDENCE, should be sent to the Managing Director, Mawdsley's Ltd., Dursley, Glos.

2374

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Region, North Thames Division

APPLICATIONS are invited for the following appointments :—

GENERAL ASSISTANT ENGINEERS, GOLDINGTON GENERATING STATION (Bedford) (S.V. No. 1543).

Salary N.J.B. Class H, within the range of Grades 16/14, Scales 1/3, £625 - £805 per annum, plus £90 per annum shift allowance whilst engaged on shift duties. The commencing salaries will depend upon the duties and responsibilities.

Duties of the above post include assisting in the electrical control room and experience in the technical operation of electrical, boiler house and turbine house plant, testing, etc., in a generating station, and provide a suitable basis for promotion to higher technical grades.

Manual workers in skilled grades with suitable technical training will be considered. Previous experience in a generating station and/or technical training to the standard of Ordinary National Certificate or its equivalent will be of advantage.

Applications, quoting reference S.V. No. 1543, stating age, qualifications, experience and present position should be sent to the Personnel Officer, Central Electricity Generating Board, North Thames Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts., to arrive not later than 30th September, 1961.

F. W. SKELCHER,
Assistant Regional Director.

2382

Eastern Electricity

Northmet Sub-Area

(a) District Commercial Assistant, St. Albans District (Ref. 1082)
(b) Senior Sales Representative, St. Albans District (Ref. 828)

CANDIDATES for (a) should be fully experienced in modern installation practice, able to prepare specifications and competitive quotations, and be competent to design thermal storage heating schemes, particularly floor warming. A sound knowledge of tariffs and their application, including supply by special agreement, is necessary.

Candidates for (b) must have had a sound practical training with experience in electrical installation work for domestic and commercial premises. A good knowledge of electrical water heating and ability to prepare wiring specifications and estimates is required, with an all-round knowledge of and an ability to sell domestic electric appliances.

Salary (a) N.J.C. Grade III (£780-£880).
(b) N.J.C. Grade II (£700-£775).

Apply by letter to F. J. Drake, Assoc.I.E.E., Manager, Eastern Electricity Board, 107, St. Peter's Street, St. Albans, Herts., by 2nd October, 1961.

2394

SOUTH EASTERN ELECTRICITY BOARD

STORES SUPERVISOR, Eastbourne District. Applicants should possess good knowledge of electrical engineering stores and equipment, have organising ability and be capable of controlling staff. A knowledge of purchasing and stores procedures is necessary. Salary £780 per annum rising to £880 p.a. Superannuable.

Applications, quoting ER and naming two referees, to District Manager, SEEBOARD, Electric House, Grove Road, Eastbourne, by 4th October, 1961.

GEORGE WRAY,
Secretary.

2389

CANADA

CAREER OPPORTUNITIES FOR ELECTRONIC ENGINEERS WITH RCA VICTOR IN CANADA

RCA Victor, Canada's foremost pioneer of the electronics age, has openings for Engineers in its Technical Products Division at Montreal.

Interesting and challenging assignments, calling for individual initiative and creativity, are available at intermediate, senior, and supervisory levels in the following areas :—

HF, UHF and SHF Techniques and Circuitry
SSB Receiver and Transmitter Development
Transistor Circuit Design and Application
Amplitude and Delay Equalization Network Design
Antenna and RF Filter Design
Multiplex Design and Development

Vacancies will be filled by graduate engineers having at least two years' experience in one or more of the above fields. Salaries and advancement are based on experience and ability. Successful applicants will have access to the most modern and complete facilities and will work alongside engineers and scientists of RCA Victor's Engineering team, in an atmosphere conducive to maximum professional growth. A few positions are open in our Research Laboratories to engineers or scientists with a Ph.D. degree or other evidence of exceptional ability.

Engineers interested in joining RCA Victor, a company with a full programme of employee benefits and a progressive salary structure, are invited to investigate these opportunities.

Send résumé of detailed background to :—

Administrator, Technical Employment
RCA VICTOR COMPANY LIMITED
901 Lenoir Street, Montreal, Canada

All replies will be treated with strict confidence and acknowledged promptly.

Arrangements are to be made for personal interviews with Company representatives. 2356

CENTRAL ELECTRICITY GENERATING BOARD

TRANSMISSION PROJECT GROUP, GUILDFORD

SECOND ASSISTANT ENGINEERS

APPLICATIONS are invited for the appointment of Second Assistant Engineer at the above offices, for work associated with the design, construction and programming of extensions to the Generating Board's main transmission system.

Candidates should preferably have a University Degree or Higher National Certificate in Electrical Engineering, have experience in the manufacture and construction of high-voltage transmission equipment and the layout of high-voltage substations. Familiarity with the programming and progressing of major electrical installations and with the preparation of enquiries and assessment of tenders for the requisite plant would be an advantage.

Salaries will be within the range £1,460 to £1,950 per annum.

Applications stating age, qualifications, experience, present position and salary should be forwarded to D. M. Porter, Group Administrative Officer, Burymead House, Portsmouth Road, Guildford, Surrey, to arrive not later than Tuesday, 3rd October. Please mark envelope "Confidential" and quote ref. ER/21.

2343

CENTRAL ELECTRICITY GENERATING BOARD

Western Division

ASSISTANT HEALTH PHYSICIST
required at
HINKLEY POINT
NUCLEAR POWER STATION

THE CENTRAL ELECTRICITY GENERATING BOARD invite applications for the post of Assistant Health Physicist at the Hinkley Point Nuclear Power Station at Bridgwater, Somerset.

This post embraces practical and administrative responsibilities in the field of radiological protection. A wide range of varied problems may be anticipated as the Health Physics Department provides a comprehensive station monitoring service together with an extensive District survey programme.

Applicants should preferably possess an appropriate degree or qualification. Previous experience in health physics would be an advantage but is not essential as the successful applicant will be given a course of training.

Salary will be within the N.J.B. Class O, Grade 7, Scale 16, £1,795-£1,950 per annum. Superannuation scheme.

Application should be made on form A.E.6 ACT, available from Divisional Secretary, Western Division, 26, Oakfield Road, Clifton, Bristol, 8, to be returned by 3rd October, 1961, quoting reference ER/AV/89/61.

2398

ESTIMATOR

required by

ELECTRIC MOTOR MANUFACTURERS

(Near S.E. LONDON)

TO PREPARE TENDERS FOR SPECIALISED PLANT

Permanent Position. Good Prospects. Contributory Pension Scheme

Box No. 2373

***Situations Vacant** (continued)*

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Region, North Thames Division

APPLICATIONS are invited for the following appointment :—

STATION SHIFT CONTROL ENGINEER, BEDFORD GENERATING STATION (S.V. No. 1530).

Salary N.J.B. Class D, Grade 10, Scale 3, £715-£805 per annum, plus £90 per annum shift allowance.

Applicants should have reached the standard of Ordinary National Certificate in Electrical Engineering, or its equivalent, have experience in the operation of a switchboard at a generating station, and be fully conversant with high-voltage switching operations and protective systems.

Applications, quoting reference S.V. No. 1530, stating age, qualifications, experience and present position should be sent to the Personnel Officer, Central Electricity Generating Board, South Eastern Region, North Thames Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts., to arrive not later than 30th September, 1961.

F. W. SKELCHER,
Assistant Regional Director.

2381

HACKNEY TECHNICAL COLLEGE

Dalston Lane, London, E.8

LECTURER IN ELECTRICAL ENGINEERING required from 1st January, 1962, to teach up to H.N.C. in Electrical Technology and either Electrical Power Supply or Electronics.

The successful candidate will be required to assist in the general running and development of the electrical engineering laboratories. Applicants should be university graduates in electrical engineering and/or Corporate Members of the Institution of Electrical Engineers, and should have industrial and/or teaching experience.

Salary scales (at present under review): Lecturer, £1,408 - £1,601.

Further details and application forms from Secretary, to be returned within 14 days. Please quote (FE.3a/R/2557/9).

2380

BEDFORDSHIRE COUNTY COUNCIL

Heating and Electrical Section

APPLICATIONS are invited from appropriately qualified persons for the post of ENGINEERING ASSISTANT, A.P.T. Grade III (£960-£1,140).

Applicants must be competent draughtsmen and have a knowledge of electrical installation work.

The commencing salary within the grade will be in accordance with qualifications and experience.

Application forms obtainable from the County Architect, Shire Hall, Bedford, to be returned by 9th October, 1961.

2393

SENIOR TRANSFORMER DESIGNER

with experience of various types up to 5 MVA. This appointment carries a very realistic salary and scope for the future for the right man between 30-40.

A company house is available if required. Factory is situated in ideal rural surroundings four miles from the sea.

Apply Chief Designer, London Transformer Products Ltd., Bridgend, Glam.

206

RHODESIA CONGO BORDER POWER CORPORATION LIMITED

Kitwe, Northern Rhodesia

Technical Engineers

APPLICATIONS are invited from qualified Electrical Engineers (Degree or Corporate Membership) for the position of TECHNICAL ENGINEER on the Corporation's Engineering Staff at Kitwe, Northern Rhodesia, the operational centre of its 220-kV and 66-kV networks.

Applicants should be preferably in the age group 28/38, having had at least five years' experience in the electricity supply industry or in the manufacture of apparatus related to the supply industry.

The duties will include:—

1. Calculations related to system load studies, protective gear settings, maximum short circuit evaluations, including the use of a D.C. analyser board. Experience in tariff computations would be an advantage.
2. Supervision of the Protection Department, which is responsible for the installation, commissioning and maintenance of modern forms of protective gear and including carrier frequency electronic telemetering, remote control and communicating apparatus.

The design of the equipment is at present the responsibility of the Corporation's Consulting Engineers, with whom the Technical Engineer would be required to maintain close liaison.

The commencing basic salary will be in the region of £1,800-£2,000 (Rhodesian currency) per annum, dependent on experience. The successful applicant will participate in the Corporation's bonus scheme. The rate of bonus is related to the prosperity of the copper mining industry. The present rate is 36½% of basic salary. Housing (including basic heavy furniture) will be provided at a sub-economic rental.

Medical specialist fund, pension and life assurance schemes are provided. In the case of the latter the employee contributes a minimum of 5% basic salary and the Corporation a further 5%, plus ½% for each completed year of service.

Paid leave will be at the rate of 51 days per annum, and may be accumulated to a maximum of three years' entitlement.

The Corporation is responsible for all electricity supplies to the copper mining industry in Northern Rhodesia. The system load is at present 260 MW, 1,800 million kWh per year.

All applications, giving full details of experience, marital status, etc., should reach:—

The Secretary,
Rhodesia Congo Border Power Corporation Limited,
P.O. Box 819,
Kitwe, Northern Rhodesia,

not later than 15th October, 1961.

2363

WORKING ELECTRICAL FOREMAN REQUIRED

ONLY a man with drive need apply. Applicants willing to travel away from home. Wage will be £17 to £18 per week with generous subsistence allowance and bonus scheme. State age and general experience.—Box 2215.

BUILDING RESEARCH STATION (D.S.I.R.)

Garston, near Watford, Herts

MAIN GRADE ENGINEER or SENIOR SCIENTIFIC OFFICER required for research and development in connection with engineering services in hospitals and other types of large domestic or public buildings. Suitable experience will include: (1) Research or development on heating systems, mechanical ventilation and electrical installations for domestic or factory buildings or in shipbuilding industry. (2) Development or design of mechanical or electrical engineering services in chemical plants, oil refineries, etc.

Quals.: Engineer, A.M.I.Mech.E. or A.M.I. Elec.E.,, with at least 5 years' experience in a responsible position. Age range preferably 30-40. S.S.O., 1st or 2nd Class Hons. Degree in Mechanical or Electrical Engineering, with at least 3 years' postgraduate experience in research or development in a relevant field.
Salary: Engineer, £1,416 - £1,950 ; S.S.O. £1,302 - £1,654.

Forms from Director at above address.

2366

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

GENERAL ASSISTANT ENGINEER is required in the Site Maintenance Department for the Hams Hall Group of Power Stations, near Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade N.17, £825-£940 per annum.

The appointment is permanent with excellent opportunities for advancement. It is necessary that applicants should have received a sound technical training and should preferably have had some industrial engineering experience, and have as a minimum qualification the Ordinary National Certificate.

Apply, quoting Vacancy No. 247/61 MD, on form AE6, available from the Station Superintendent, Hams Hall Power Station, Lea Marston, Sutton Coldfield, Warwicks., by 2nd October, 1961.

2391

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

SHIFT CHARGE ENGINEER is required at Warwick Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade E.7, £965-£1,090 per annum, plus 10% shift allowance.

Applicants should have a sound technical training and practical experience in the operation and maintenance of steam generating plant and main switchgear. Appropriate technical qualifications will be an advantage.

Apply, quoting Vacancy No. 244/61 MD, on form A.E.6, available from the Station Superintendent, Warwick Power Station, Emscote Road, Warwick, to whom they should be returned to arrive by 2nd October, 1961.

2364

NORTHAMPTON COLLEGE OF ADVANCED TECHNOLOGY

St. John Street, London, E.C.1

GRADE III LABORATORY TECHNICIANS required in Electrical Engineering Department. In addition to holidays with pay totalling up to five weeks per year, part-time day release is granted for approved studies.

Standard L.C.C. conditions; salary scale from £550 p.a. rising to £750 for possessors of O.N.C. or G.C.E. "A" levels, or equivalent. If not yet qualified £470 rising according to age to £670 p.a.

Letters of application to Head of Electrical Engineering Department.

2346

ELECTRICAL ENGINEERS

Graduate or Chartered Electrical Engineers Required

aged not less than 30, for Industrial Group Consulting Service based in Birmingham.

Candidates should be well educated and have had three years' practical training with a large electrical manufacturer in workshops and drawing office.

Experience is desired in factory supply, distribution and utilisation, with ability to design schemes, specify and engineer electrical extensions and new factory installations. Supervision of contractors and negotiations with managements within the Group at Managing Director levels.

In particular knowledge of variable speed drives, protection, heat treatment, automatic contactor control gear, H.V. and M.V. switchgear would be desirable advantages.

Initiative, drive and personality are as important as technical attributes, and opportunities to transfer within the Group may occur from time to time.

The Group provides for pension scheme, educational benefits, removal allowance, 3 months' subsistence allowance, car mileage allowance, annual pay reviews.

Applications will be treated in confidence and should be forwarded to:—

The Chief Electrical Engineer
T. I. (GROUP SERVICES) LIMITED
72, Cheston Road, Aston, Birmingham, 7
and should be endorsed "ENGINEERS."

2231

LONDON ELECTRICITY BOARD

Assistant Distribution Engineer

APPLICATIONS are invited for the above position in the Board's Western District. The successful applicant will be based at 154, Uxbridge Road, Shepherds Bush, London, W.12, but will be required to work anywhere in the District.

Applicants should have a sound technical education to the standard of the Higher National Certificate and possess practical experience of all branches of engineering work associated with the organisation of a District distribution department.

The post is graded under Schedule A of the National Joint Board Agreement as Class H, Grade 9, £1,090 per annum rising to £1,215 per annum, inclusive of London allowance.

Applications stating age, qualifications and experience should be sent to the Manager at the above address within 14 days of the publication date of this notice. Please quote ref. PER/V/3223/R.

2379

ELECTRICAL ENGINEER

ASSISTANT ELECTRICAL ENGINEER required by steel tube manufacturers in Birmingham, to be directly responsible for all the electrical maintenance and repairs of an interesting and diverse plant including a large number of overhead cranes and all other lifting appliances, total load 7,000 kVA.

This is an excellent opportunity for a young man who is between the ages of 25 and 32, who has a university degree or equivalent, and has served a recognised apprenticeship or training for at least 3 years in electrical engineering.

Contributory pension scheme, canteen and social club facilities.

Apply stating age, qualifications, experience and salary required to the

Personnel Manager
TUBES LIMITED
Rocky Lane, Aston, Birmingham, 6

2397

To expand an active development team

BRYCE

require a

DEVELOPMENT ENGINEER

to work on interesting projects concerned with the manufacture of power transformers and capacitors.

Applications are invited from qualified engineers who have experience in either transformer or capacitor manufacture. Minimum standard required: Graduate Membership I.E.E.

Reply to:—

The Technical Director
BRYCE ELECTRIC CONSTRUCTION CO. LTD.
Kelvin Works, Hackbridge, Surrey

2383

TRANSFORMERS & RECTIFIERS LTD.

Millmead, Guildford

require a

SENIOR TRANSFORMER DESIGNER

for work on all types up to 1,000 kVA. The company is expanding and the position carries excellent prospects for the right man. Some experience of saturable reactors an advantage.

Evening and Saturday morning interviews can be arranged and replies treated in strict confidence. Some housing assistance could be arranged if necessary.

2234

TECHNICAL SALES ASSISTANT

with basic ELECTRICAL ENGINEERING knowledge to H.N.C. standard and sales ability required by London firm of Engineering Importers expanding sales of imported components to U.K. light engineering industry. Salary commensurate with age and experience.—Box 2348.

CANADA

ELECTRONIC TECHNICIANS

A MANUFACTURER of electronic components, located near Toronto, Ontario, requires several ELECTRONIC TECHNICIANS with military electronic equipment experience for the assembly of transistorised circuits, sub-miniature work and fire control equipment (airborne radar or electronic computors).

40-hour week. Good salary and employment benefits.

Apply to:—

Dept. L.S.L.1
NATIONAL EMPLOYMENT SERVICE OF CANADA
38, Grosvenor Street
London, W.1

2362

CENTRAL ELECTRICITY GENERATING BOARD

South Thames Division

Littlebrook Power Station

ASSISTANT ENGINEER (Efficiency) (Vacancy No. 247/61). The successful applicant will assist in the Station Efficiency Section in investigations into the thermal performance of plant. Technical qualifications to H.N.C. standard are desirable and practical experience in generating station work would be an advantage.

Salary N.J.B. Class 11, Grade 14, £940 to £1,065 per annum, including London allowance.

Applications giving age, details of experience, qualifications, etc., should be sent to the Station Superintendent, Littlebrook Power Station, near Dartford, Kent, to arrive by 6th October.

2392

ELECTRICAL— QUANTITY SURVEYOR

DIRECTOR'S DEPUTY required for Electrical Department of London Contracts Division of large Group. Applicants (35-45) with experience and knowledge of electrical quantities in commercial and industrial buildings and conversant with contract law and conditions. Must be prepared to range from measuring on site to negotiating with principals in tender and completion stages of contract.

This position will be first in succession to Executive Director and has prospects in the future for a man of business ability and suitable bearing.

Write stating age, experience very fully, previous employment and present salary to—Box 2399.

***Situations Vacant** (continued)*

NORTH THAMES GAS BOARD

ENGINEER-DESIGNER (Electrical) required to take charge of the electrical engineering section of the Chief Engineer's Department drawing office and to be responsible for the preparation of drawings, schemes and specifications for electrical work at the Board's various works.

Applicants, who should be not less than 35 years of age, must be Corporate Members of the Institution of Electrical Engineers with good experience in heavy electrical engineering, and in the application of telemetering and remote control equipment.

The starting salary will be between £1,600 and £1,850 per annum according to experience, and the successful candidate will be required to join the Board's contributory pension scheme.

Applications giving full details should be sent within 14 days of the appearance of this advertisement to the Staff Controller, North Thames Gas Board, 30, Kensington Church Street, London, W.8, quoting reference ER/1057.

2400

SOUTH WESTERN ELECTRICITY BOARD

FOURTH ASSISTANT DISTRICT ENGINEER, WEST CORNWALL. Salary within Class G, Grade 11, Salary Scale 5, £825 to £940 per annum of the N.J.B. Agreement.

The successful candidate will be primarily responsible to the First Assistant District Engineer (Construction) for duties in connection with supervision of the erection of overhead lines and/or underground cable laying. He may also be required to undertake other general engineering duties, including standby.

Possession of the Higher National Certificate in Electrical Engineering is desirable and the ability to drive a car will be an advantage.

Applications for this post to be made on standard form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from the District Manager, South Western Electricity Board, 13, Basset Road, Camborne. Closing date for receipt of completed applications is 7th October, 1961.

2401

ELECTRICAL ENGINEER, GAMBIA

QUALIFICATIONS: A.M.I.E.E.

DUTIES: To take charge of the Gambia Electricity Department.

EMOLUMENTS (including gratuity) in scale £2,167 to £2,530 per annum according to experience.

TERMS OF APPOINTMENT: Contract for one or two tours of 12-24 months. Free passages. Education allowances up to £200 per annum per child.

Apply Director of Recruitment, Department of Technical Co-operation, Carlton House Terrace, London, S.W.1. Give full name and brief details of age, qualifications and experience. Quote BCD.145/12/01/D11.

2395

AN ELECTRICAL TECHNICIAN

is required in our ELECTRIC MOTOR DEPARTMENT. Must be familiar with the design and manufacture of all types of electric motors. Must also be expert in handling various types of switchgear used in complex electrical circuits such as are to be found in modern machine tools.

A house will be provided for applicant who proves satisfactory.

MURAD DEVELOPMENTS LTD.
Queenborough, Kent 2396

APPLICATIONS are invited by Kennedy & Donkin, 12, Caxton Street, London, S.W.1 (ref. RFL), for the post of assistant in the cable department at their Weybridge office. Applicants must be qualified electrical engineers with experience in design, manufacture and installation of cables for transmission and generation projects. 341

ASSISTANT manager with considerable experience required for wholesale electrical lighting showroom, London (City). 5-day week. —Box 2367.

CABLE engineer required for the Midlands area capable of supervising cable laying and jointing contracts. An excellent opportunity for a man wishing to take charge of an area and work with a considerable amount of freedom. Pension scheme and car provided. Reply stating age, salary and experience.—Box 2407.

CONSULTING engineers require designer/draughtsmen experienced in the design of electrical services for Government projects, hospitals, schools, etc. Excellent promotion prospects in expanding practice. Write—Locke & Beal, 303/307, Balham High Road, London, S.W.17. 2405

CONTRACTORS, senior and assistant engineers required by well-established firm, central London, for quality work of all types. Positions offer scope for advancement for capable and energetic engineers. Write fullest detail, in confidence, of experience, training, age and salary required.—Box 133.

DRAUGHTSMEN. Section leaders required for cubicle and circuit design. Min. qualifications O.N.C. and 5 years' experience similar work. Higher than A.E.S.D. rates. Write to—Works Manager, Harmer & Simmons Ltd., Roebuck Road, Hainault, Essex. 2279

ELECTRICAL cable makers require experienced representative for Midlands area. Salary plus commission give immediate earnings of £1,400 per annum with ample scope for improvement. Successful applicant would also be required to take control of branch premises in Wolverhampton. Some experience of radio and television industry would be an added advantage. Car provided. Pension scheme. Apply in strict confidence to Sales Director, Permanoid Limited, Manchester, 4. 2368

ELECTRICAL estimating engineer required for installation contracts, with ability to design and layout industrial and commercial installations. Attractive opportunity with expanding organisation based in North Midlands. Details of experience, age and salary required to—Box 8334.

ELEC. wholesalers require clerical asst. with some knowledge of lighting equipment. Progressive position.—L.E.C., 92, Blackfriars Road, London, S.E.1. 2360

EXPERIENCED servicing engineer required by a medium-sized engineering co. in N.W. London to service and maintain electric vehicles (including I.T.D. and conveyancer fork-lift trucks). Good wages, canteen, pension scheme. Apply to the Employment Officer, E.N.V. Engineering Co. Ltd., Hythe Road, Willesden, London, N.W.10. 2349

INTERMEDIATE electrical draughtsman required for work on automatic control systems and production details of electrical controls for chemical engineering firm in W.4 district London. Salary commensurate with experience. Write details experience and age to—Box 8338.

JUNIOR draughtsman or draughtswoman, preferably with experience of electrical installations, required for electrical department of a large firm of building contractors and engineers situated in London, to prepare schemes and final drawings. Applications, with full details of experience and stating age and salary required, should be sent to—Box 2336.

MINISTRY OF LABOUR. H.M. Electrical Inspector of Factories. Pensionable post for man or woman at least 35 on 1.9.61 who has achieved Corporate Membership of I.E.E.; degree in electrical engineering desirable. Candidates must have had several years' professional experience in electricity supply, electrical manufacturing works or large industrial electrical installations, and should have knowledge of, and preferably experience in, light current electrical engineering (instrumentation and electronic engineering). Starting salary (national) £1,456 (at 35) to £1,716 or, exceptionally, higher (at 40 or over). Scale maximum £2,392. Promotion prospects. Write Civil Service Commission, 17, North Audley Street, London, W.1, for application form, quoting S/5385/61. Closing date 16th October, 1961. 2378

MANUFACTURERS of cable trunking require agents with well-established connections in Eastern, Southern and Western Counties. State in confidence details of lines already represented and areas worked.—Box 2299.

MUNICIPAL MUTUAL INSURANCE Limited has a vacancy for an electrical surveyor in Birmingham. Post is permanent and pensionable to satisfactory candidate who should have served an apprenticeship and have sound practical and theoretical knowledge. Technical qualification: Higher National Certificate. Salary £825 rising to £1,225 per annum. Apply in own handwriting, marking the envelope "Application Engineer Surveyor" and "Private and Confidential," to the Chief Engineer, 22, Old Queen Street, London, S.W.1. 2350

REPRESENTATIVE required by progressive electrical woodware manufacturers to take over and develop established connection in Southern England. Applicants should give fullest details of career to date and other relevant information. Remuneration: salary, commission, car allowance and expenses.—Box 2408.

REQUIRED for South of Scotland area, electrical engineer to supervise cable laying and installation contracts. Good salary and prospects for the right man. Superannuation scheme and car provided. Please write stating age, experience and salary required.—Box 2406.

SUPERVISING engineer required by Midlands company for installation contracts. Details of experience, age, etc., to—Box 8335.

TECHNICAL assistant required for preparation of service and maintenance literature for our range of electric generating sets. Good education and technical background is essential, and preferably either previous similar work or practical experience in servicing diesel generators. Exceptional prospects in expanding concern. Full details and salary required to—Grahame Puttick Ltd., Ash, Canterbury. 2351

TWO electrical engineers required in the sales department of an electrical manufacturing co. situated in the Great West Road, Brentford, Middlesex. Applicants should have had a good engineering training and be able to deal with enquiries, quotations, correspondence, etc., relating to mining and/or industrial electrical gear and associated equipment. Pension and bonus schemes in operation. Write fully stating salary required to—Box 2352.

WINDING shop foreman required for the London works of an old-established and expanding electrical repair organisation. Experienced in repairing and rewinding medium and large A.C. and D.C. machines. All applications treated in confidence.—Box 2409.

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

ELECTRICAL engineer desires senior sales appointment. Considerable experience switchgear and motor controls Competent negotiator. Widely connected.—Box 8330.

ENGINEER, supervising, estimating, 30 yrs.' extensive experience contracting. Own car. —Box 8339.

ARTICLES FOR SALE

HOUSE SERVICE METERS

200-240-v. A.C. or D.C., 10 amps. capacity, quarterly type, from 25s. each, plus 2s. 6d. carr.

UNIVERSAL ELECTRICAL CO.
221, City Road, London, E.C.1 37

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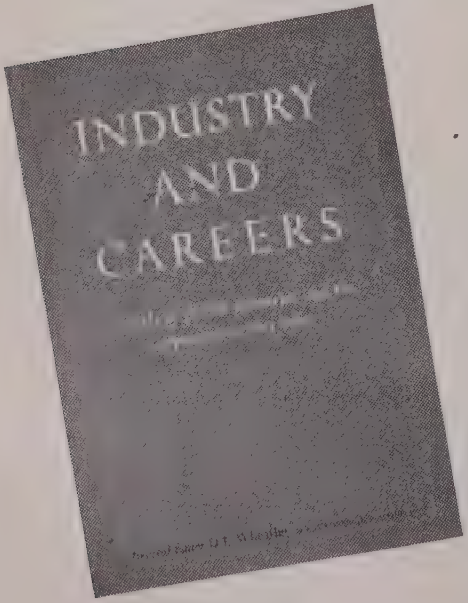

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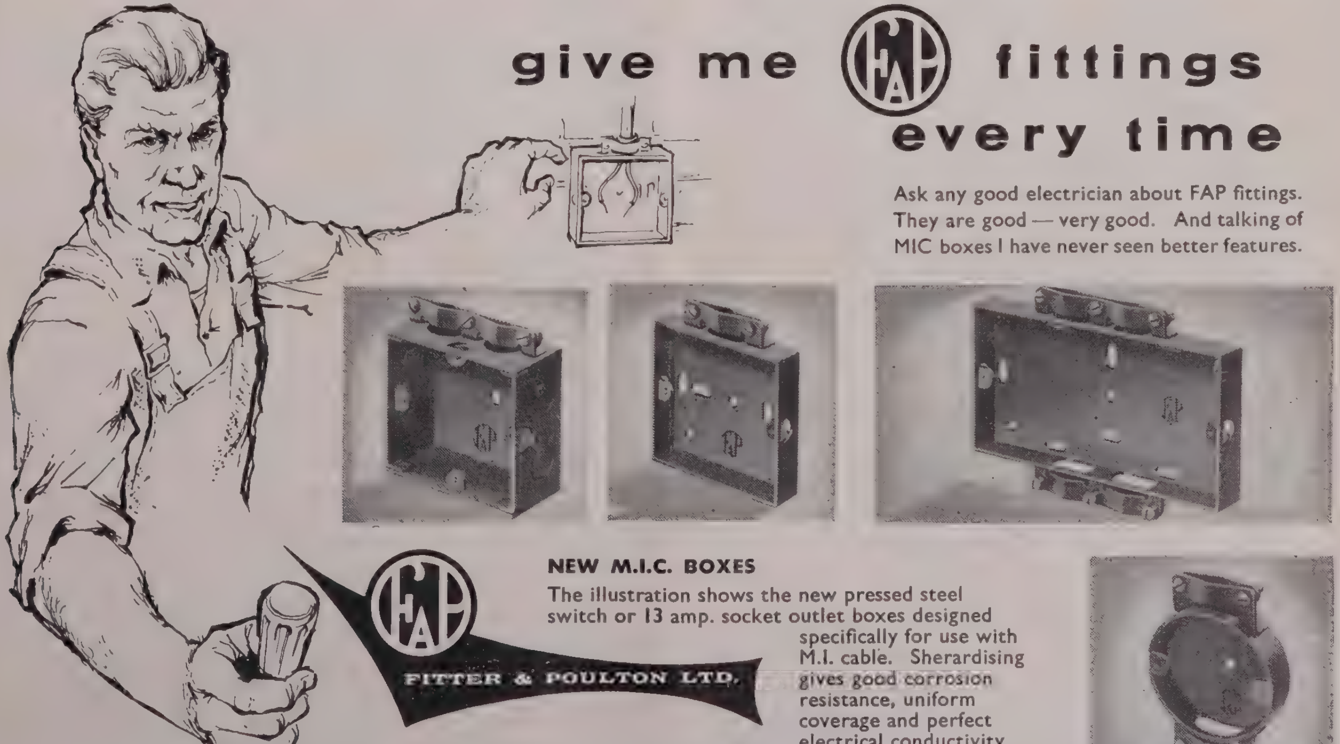
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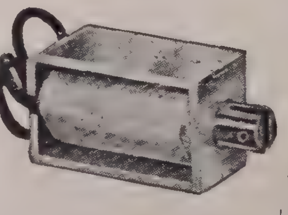

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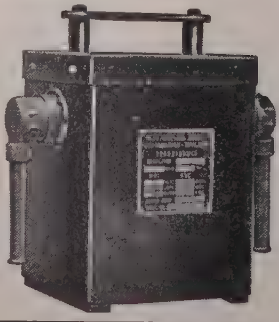

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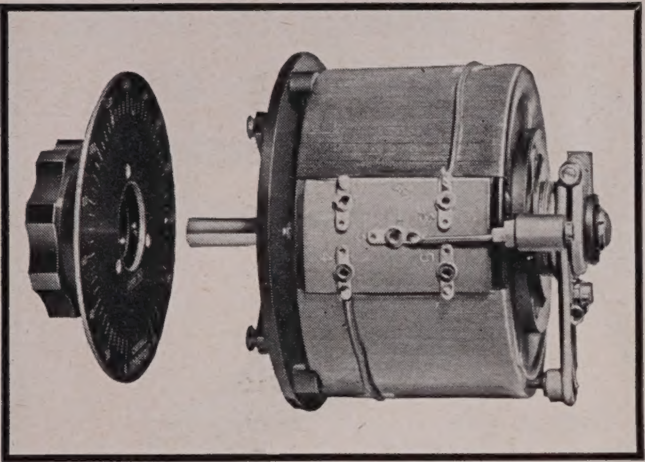

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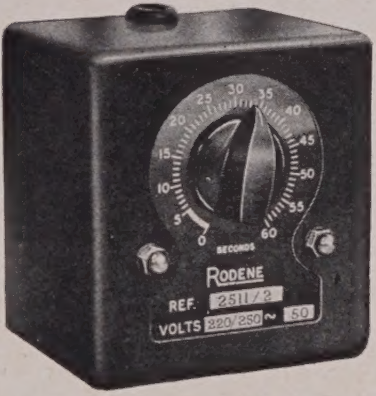

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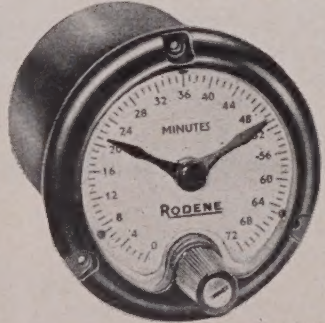

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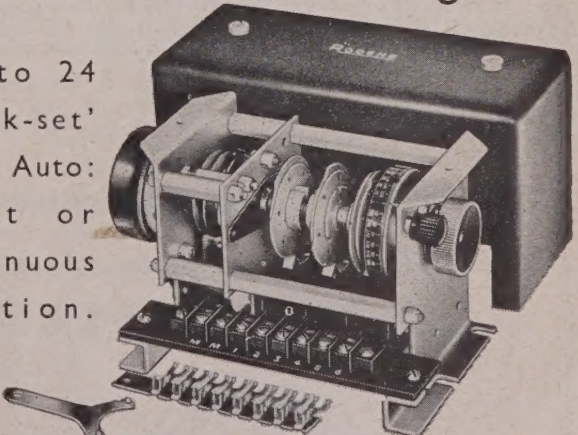

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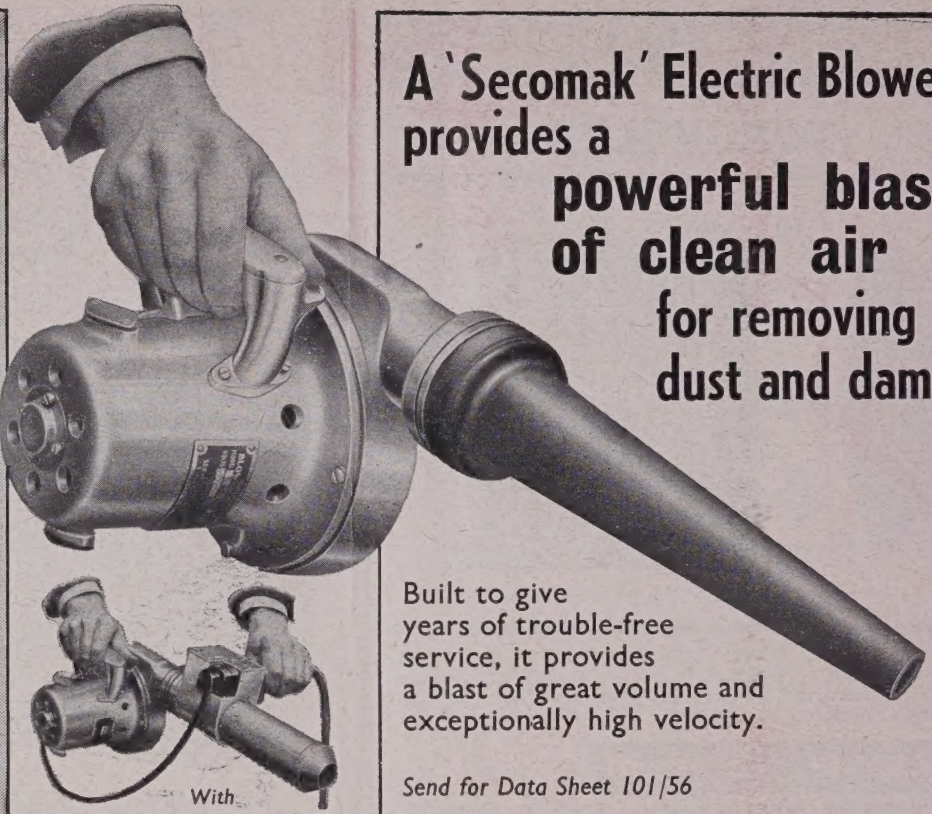
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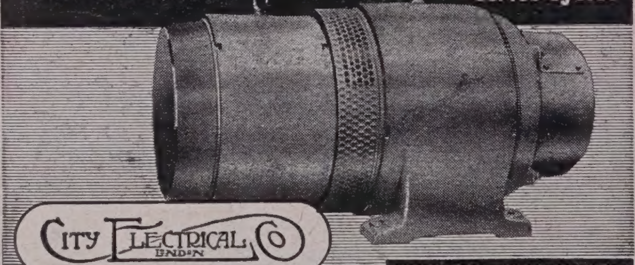

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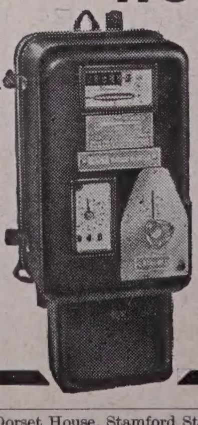

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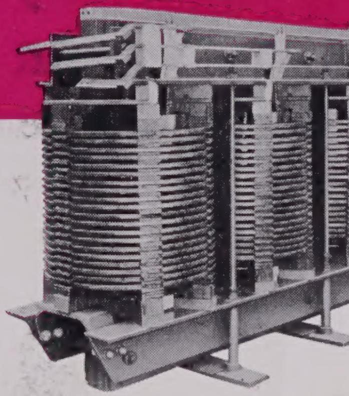
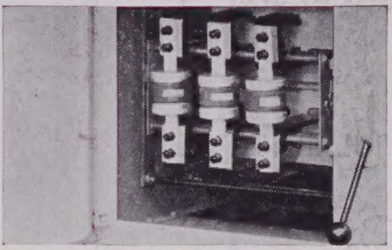
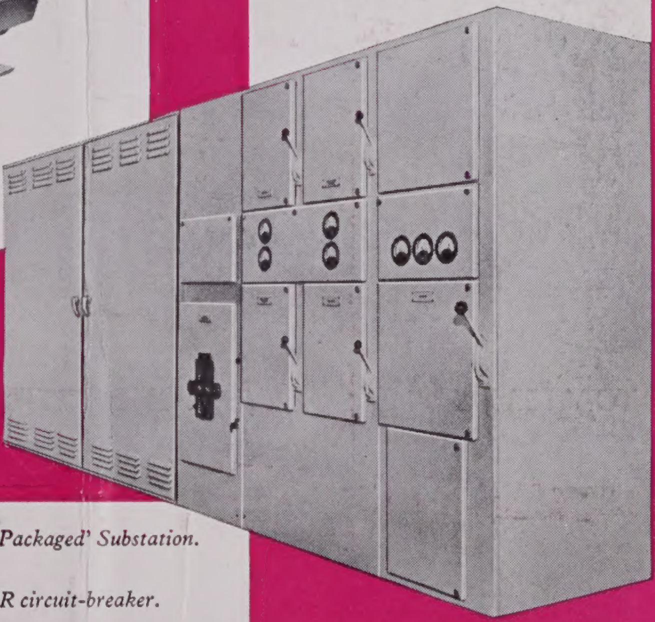
SWITCHGEAR LOGIC POINTS TO AEI



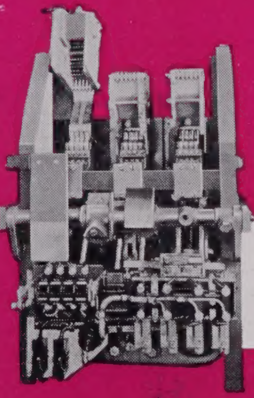
Core and windings of 500-kVA, 3-phase, 11,000/433-volt transformer.



Type CMC fuse switch unit.



The complete 'Packaged' Substation.



1600-*amp Type AIR circuit-breaker.*

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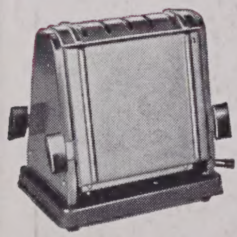

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